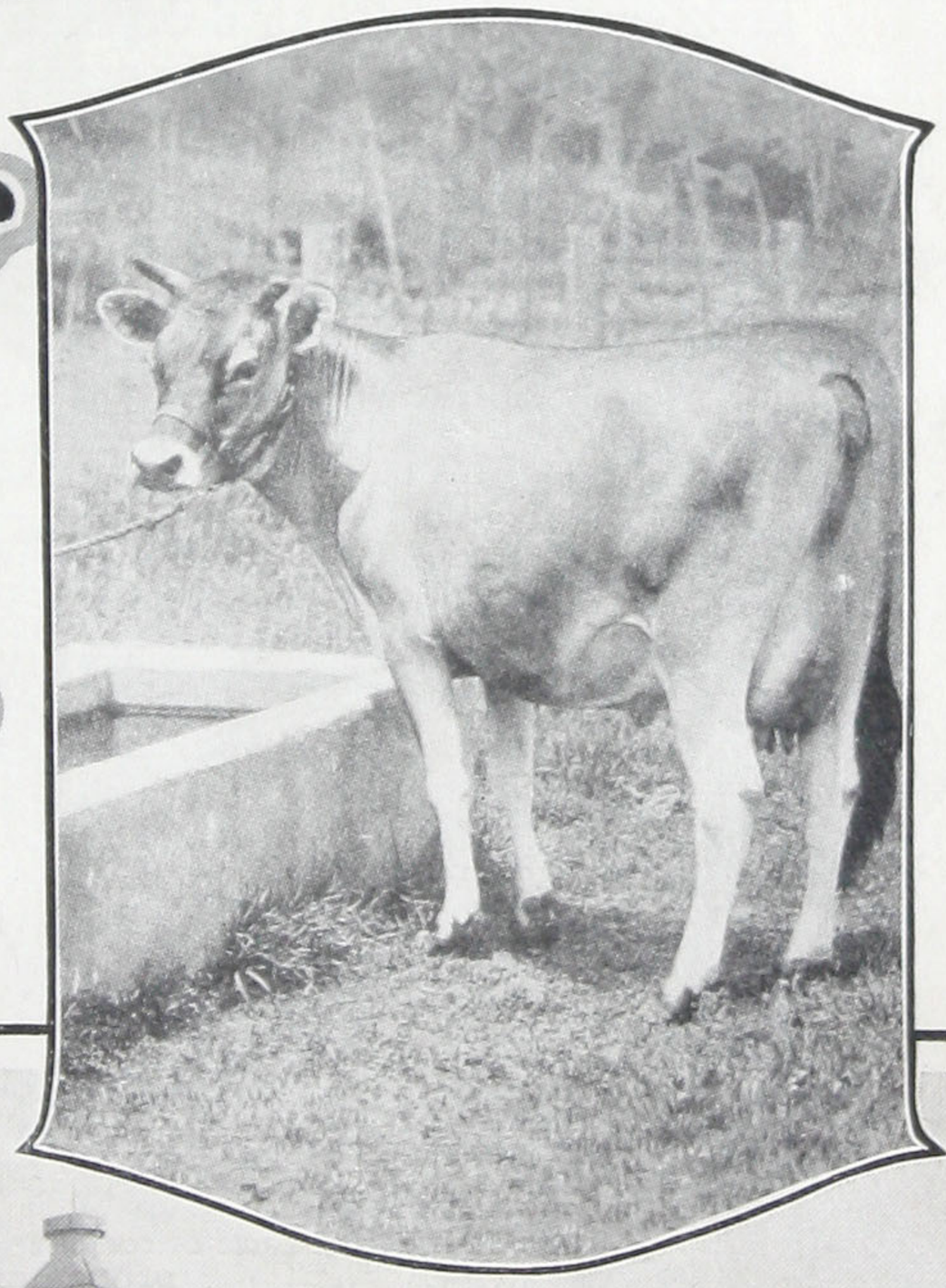
Concrete on the Dairy Farm



Concrete block barn on dairy farm of the Ingle Investment Co., Winslow, Ind.

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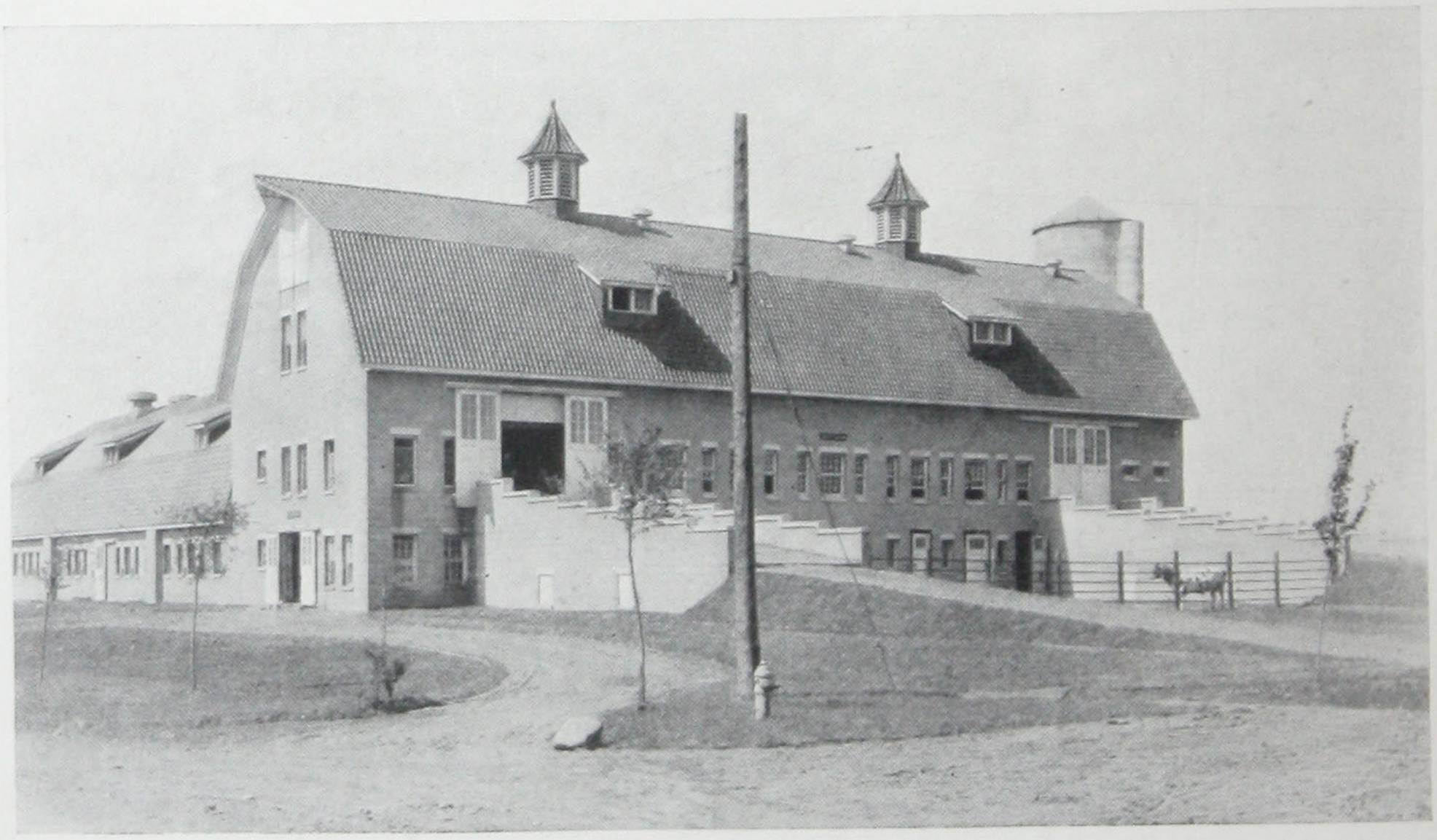
Concrete on the Dairy Farm

DAIRY cattle which are fed, managed and housed in a modern, well-arranged barn will respond to such care by yielding their owner greater profit. That dairymen realize this is evident by the extensive use of concrete now being made in modernizing dairy farms. Insanitary



The consistent use of concrete on the dairy farm puts dairying on a safe, permanent and profitable basis

and short-lived plank floors are being replaced by clean, permanent ones of concrete. Barnyard pavements and manure pits are being built to conserve valuable fertilizing elements, which under the old methods of dairy farming were frequently wasted.

Milkhouses and icehouses of concrete are permanent structures on the dairy farm, and through their use thousands of dollars' worth of products which formerly spoiled because of improper care before they could be marketed, are now increasing the dairyman's profits.

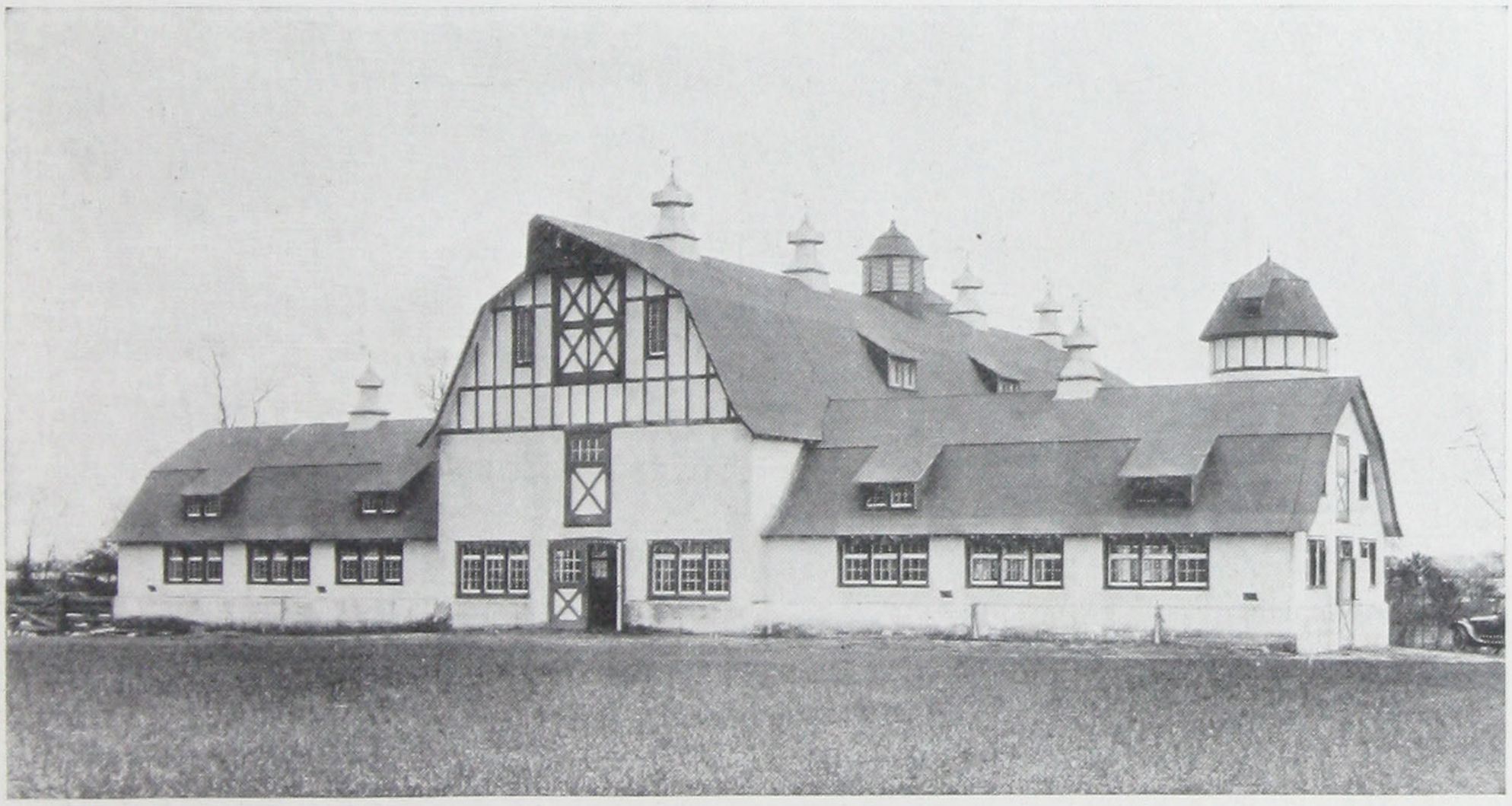
Modern sanitary watering systems, which are made more effective by concrete storage tanks and watering troughs, help to keep animals in good health and at maximum productive capacity.

Silage preserved in, and fed from permanent concrete silos is helping to solve the problem of high-priced foodstuffs.

In other words, the dairyman of to-day is meeting to-day's conditions with modern methods, conspicuous among which are modern concrete structures. With concrete he is making his farm rotproof, ratproof, rustproof, windproof, fireproof, and as nearly expense-proof as possible.

Dairy Barns

The dairy cow may be compared with a machine in that she is a complicated mechanism which turns raw materials, such as grain and other food, into the finished products, milk and butter fat. The more efficiently a machine works, the more is its earning capacity assured. If the dairy cow can be kept in good productive condition, more dollars go into the dairyman's bank account.



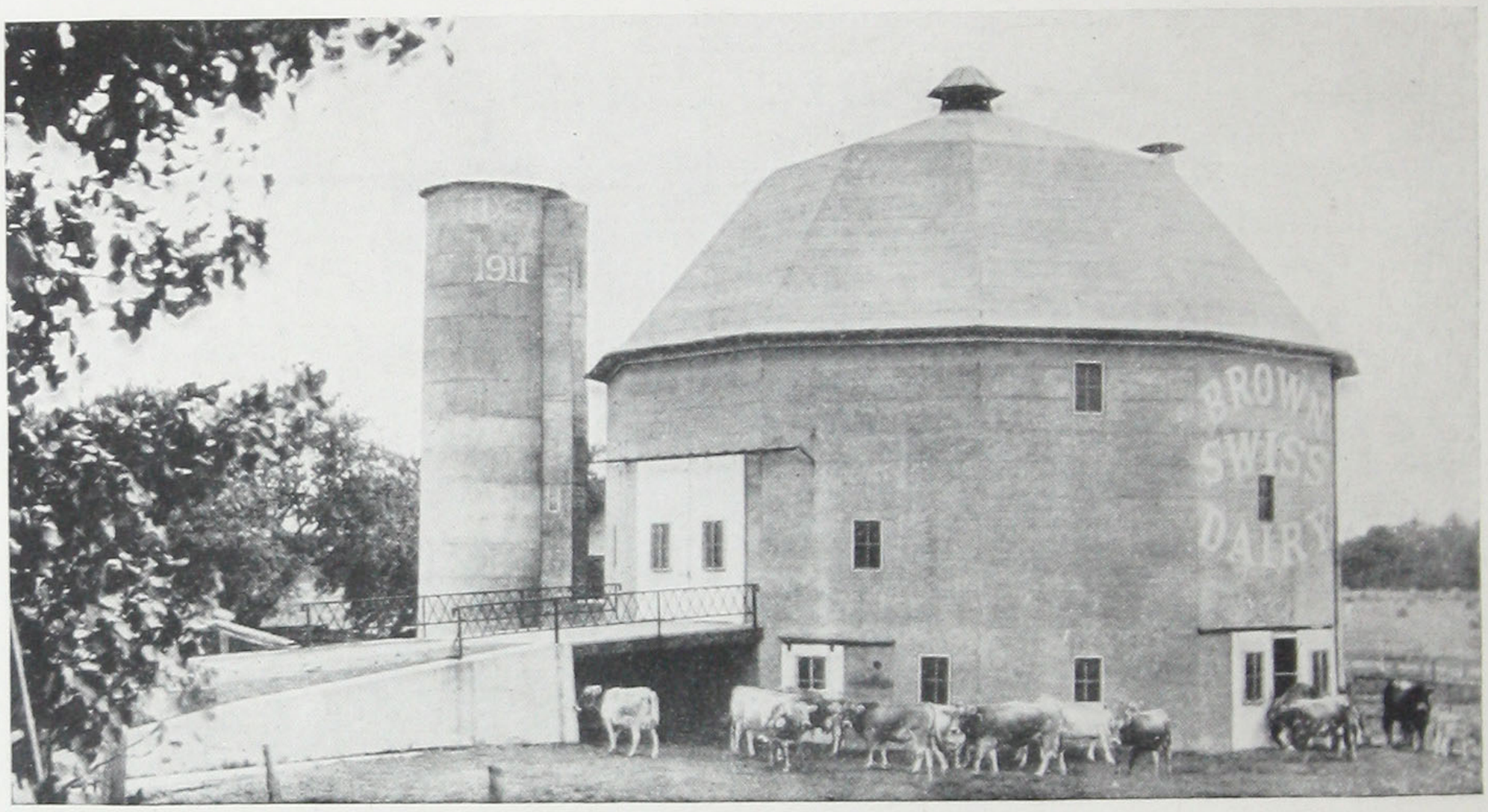
A well-built and well-arranged barn lowers the cost of feeding and otherwise caring for the stock

Only part of the feed consumed by a dairy cow goes to produce milk. The remainder must necessarily go to maintain good physical condition, which is dependent upon keeping up a good supply of body heat. Only that part of the feed which goes to produce milk enters into the dairyman's profits. He receives no direct financial returns from the feed used to keep the cow warm.

If animals are housed in uncomfortable, insanitary, foul-smelling, poorly ventilated barns their vigor and vitality is reduced to a low measure. This is because a larger portion of the feed which they receive is required to maintain good physical condition, and little of it goes to produce milk. From a business standpoint, therefore, it is important that the health and comfort of a cow be safeguarded if her keep is to be profitable. This is in a great measure insured when she is properly housed.

CHOOSING THE SITE FOR A DAIRY BARN

If possible, the dairy barn should be located so that its long dimension will extend north and south. The greatest area of window opening should be on the east and west sides. This will permit sunlight, which



M. S. Yoder, owner of the Brown Swiss Dairy Farm, Shipshewana, Ind., finds this type of concrete barn and silo a satisfactory and economical investment

is one of the cheapest and most effective agents for keeping stock quarters free from disease germs, to reach all points within the barn at some time during the day. If possible, there should be provided a sheltered yard, preferably located on the south or east side of the building.

SIZE OF THE BARN

The size of the dairy barn will depend upon the number of animals to be housed. However, it should be so planned as to permit extension when necessary to provide for increase in capacity. Individual requirements determine whether the barn should be a one, one and a half or two-story structure. Often a one and a half story building provides sufficient storage for baled hay, but the two-story type is the more economical when storage capacity is

Concrete block barns are fireproof, weather-proof and comfortable in all seasons

Concrete silo and concrete dairy barn—a combination that solves the problem of economical production of dairy products

considered in relation to cost. The cost of the roof is only slightly more on the two-story barn than on the one and a half-story type and the few additional feet of wall increases the cost relatively little.

SOME ESSENTIAL FEATURES FOR THE DAIRY BARN

An abundance of sunlight, uniform temperature, plentiful supply of fresh air with freedom from draughts and the highest possible degree of cleanliness are necessary to the dairy barn. In determining upon

Concrete was chosen for the dairy barns of the Kansas State Hospital for the Insane because of its sanitary features

the number and size of window openings, it is common to provide four square feet of glass per animal housed. Floors, mangers, gutters and alleyways should be made of concrete because it is nonabsorbent, and may easily be cleaned and kept clean. In several states local boards of health require concrete dairy barn floors.

Concrete gutters and alleyways make the work of cleaning out stock quarters easy. Because concrete floors are non-absorbent, the most valuable fertilizing elements in stable wastes are saved. Feed mangers simplify and reduce the labor of feeding stock and are highly sanitary.

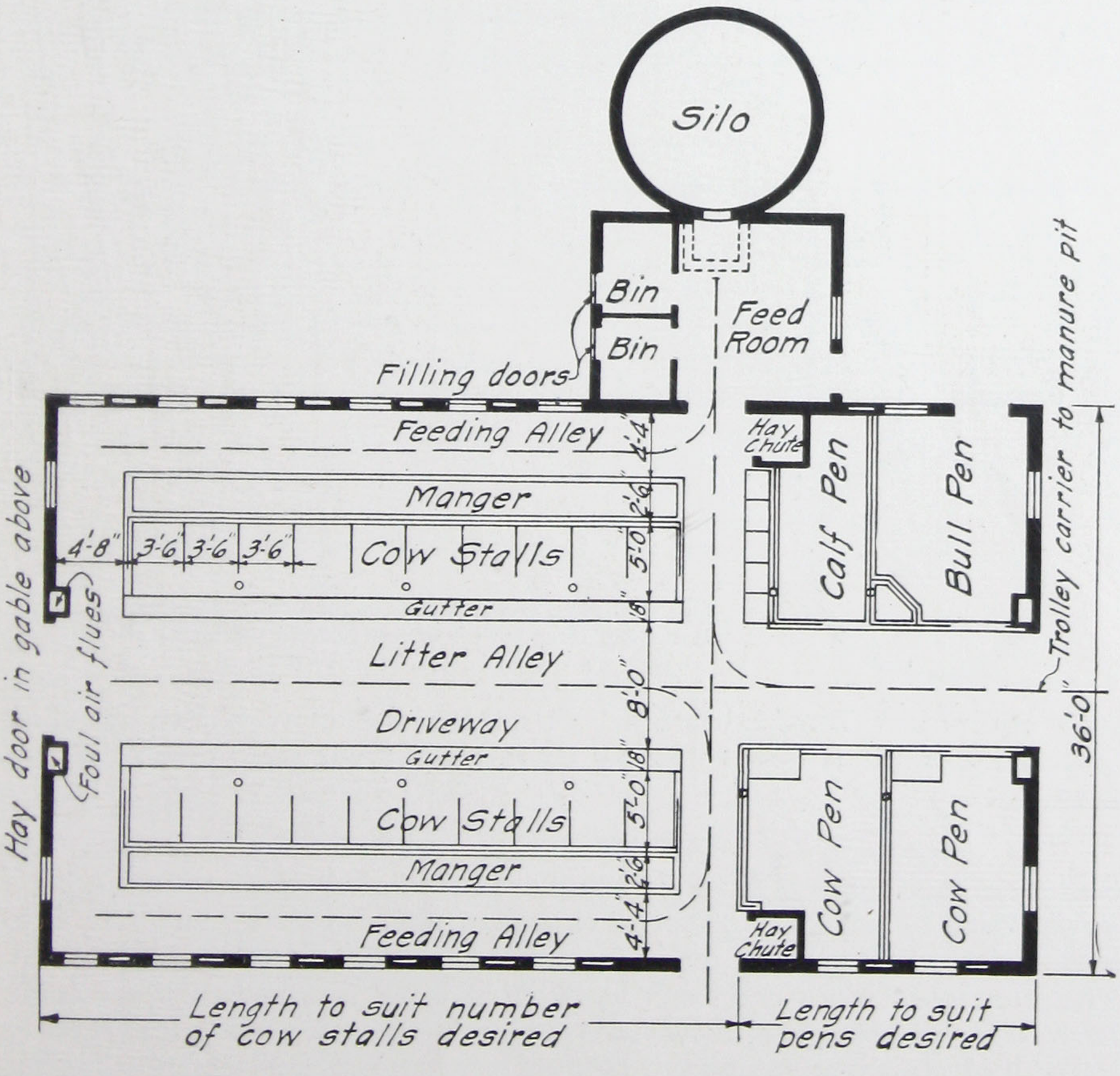
Proper ventilation should be a feature of every dairy barn

The experience of dairymen having reinforced concrete loft floors in their barns has proved the value of this feature of construction in case of fire. A number of cases are on record where the entire contents of the loft of such a barn have been destroyed by fire, while the animals below were led to safety without loss—furthermore the stock quarters were entirely unharmed.

Ventilation of stock quarters should be given careful consideration. Proper ventilation requires a continuous change of air. In accompanying plans location of flues is suggested, but the size and number of such passages will depend upon the number and kind of stock housed. In case of doubt, it is well to submit proposed barn plans to a specialist in ventilation or someone familiar with ventilating problems, and secure his opinion of the proposed details of any ventilating system.

ARRANGEMENT

A well-built, well-arranged barn lowers labor cost of feeding and otherwise caring for stock. Placing feed storage bins as near as possible to feeding points will save many steps. Alleyways should be wide enough to accommodate a silage cart, feed carrier or litter carrier, as the case may be. Hay chutes can be built above feedways, thus greatly increasing convenience in feeding. Silos should not only be located so that they will not interfere with future extensions of the barn, but the barn should be planned and laid out with the thought of possible extension in mind.

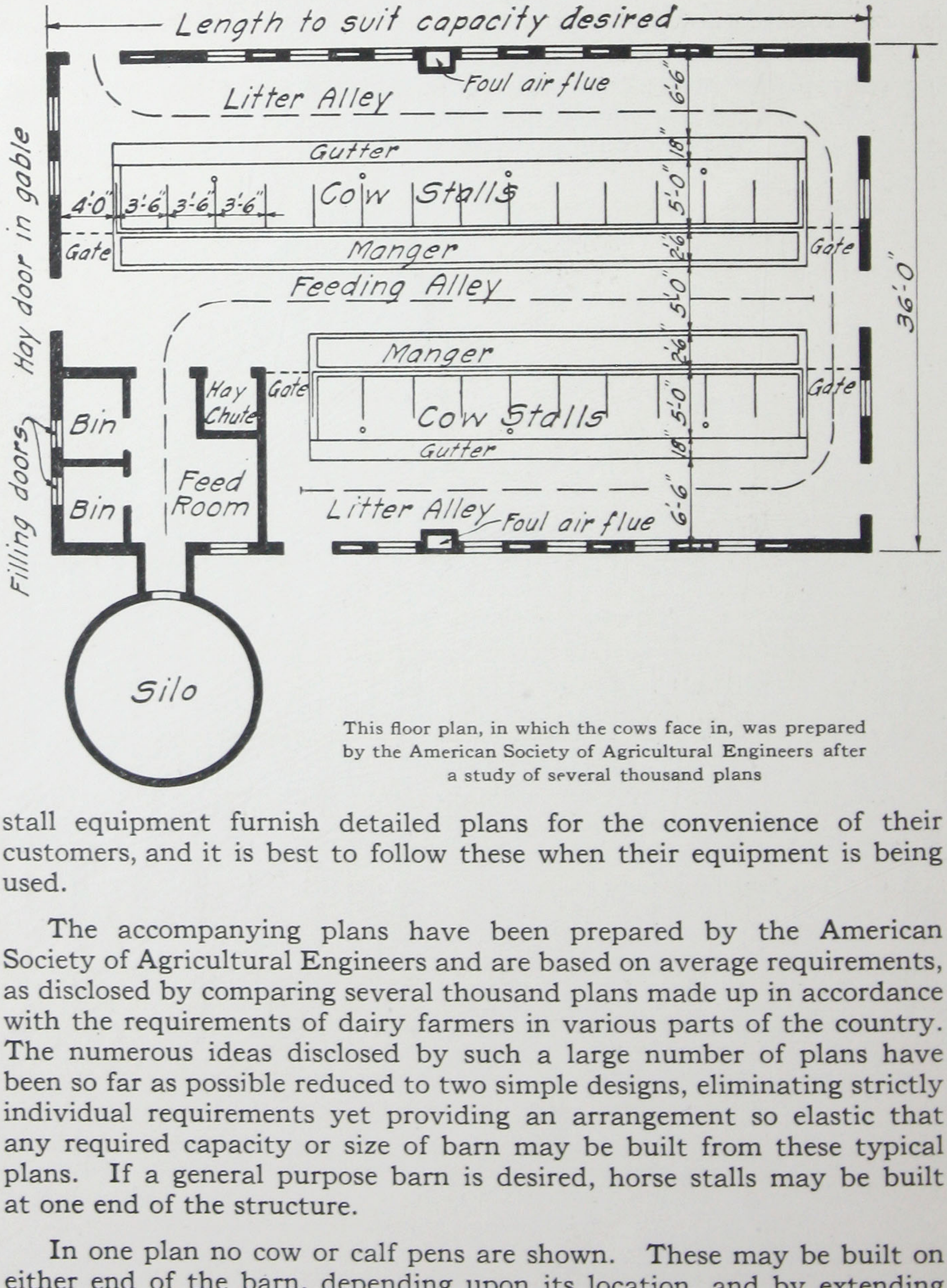


This plan, in which the cows are facing out, was designed by the American Society of Agricultural Engineers to serve the requirements of dairy farmers in various parts of the country

WORKING PLANS

It is advisable to have a definite plan to follow in the construction of a dairy barn floor. This is particularly true if steel stall equipment

is to be installed. Changes in steel work necessitated by mistakes in concrete work are expensive. In cross section drawings shown on page 12, details are given of the actual construction of feed manger, curb, stall platform, litter alleys and gutters. Most manufacturers of steel



This floor plan, in which the cows face in, was prepared by the American Society of Agricultural Engineers after a study of several thousand plans

stall equipment furnish detailed plans for the convenience of their customers, and it is best to follow these when their equipment is being used.

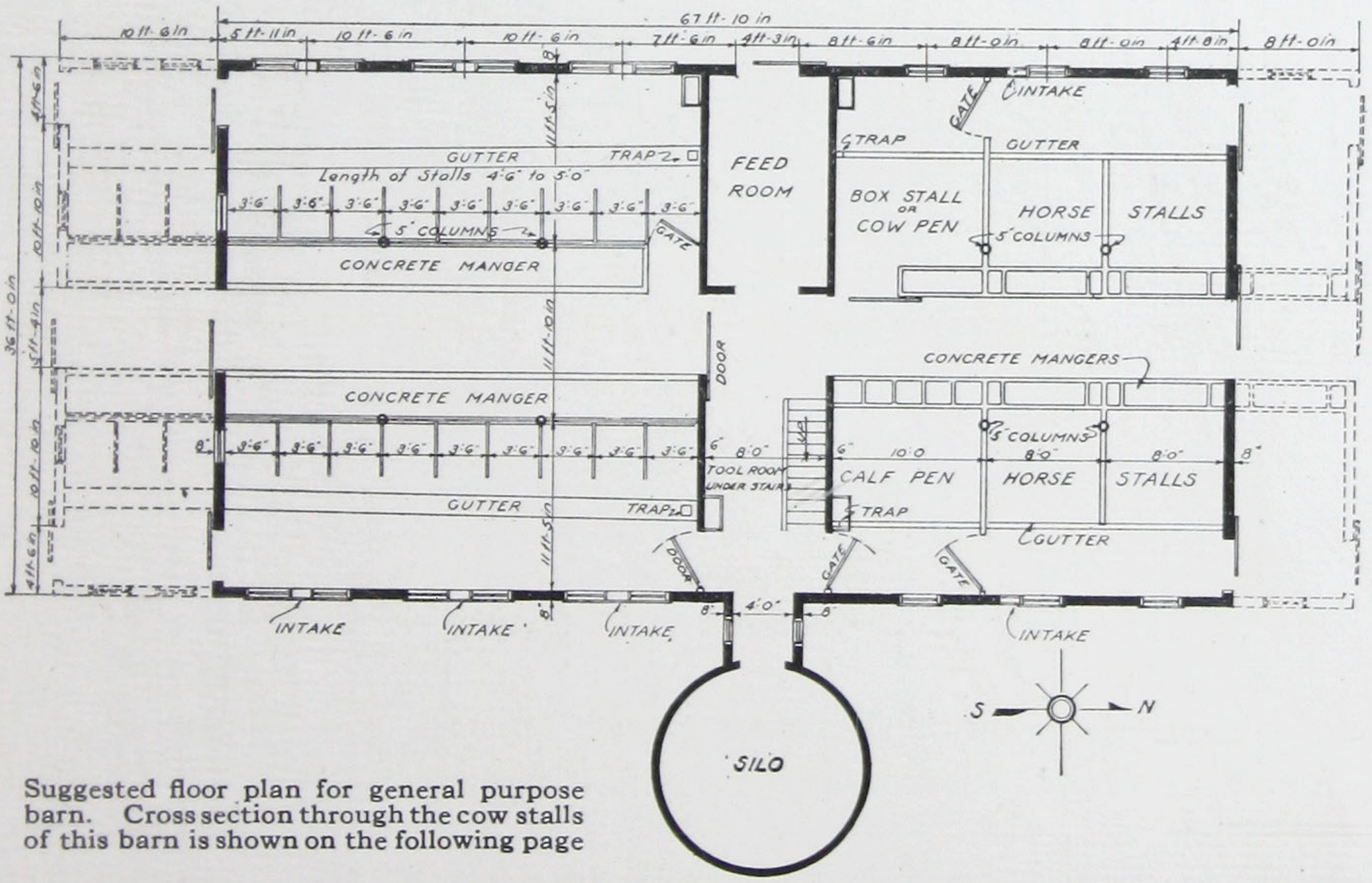
The accompanying plans have been prepared by the American Society of Agricultural Engineers and are based on average requirements, as disclosed by comparing several thousand plans made up in accordance with the requirements of dairy farmers in various parts of the country. The numerous ideas disclosed by such a large number of plans have been so far as possible reduced to two simple designs, eliminating strictly individual requirements yet providing an arrangement so elastic that any required capacity or size of barn may be built from these typical plans. If a general purpose barn is desired, horse stalls may be built at one end of the structure.

In one plan no cow or calf pens are shown. These may be built on either end of the barn, depending upon its location, and by extending the plan at either end, the structure can be made to meet the requirements of a herd of almost any size.

FOUNDATIONS

In addition to being strong enough to carry the load of the building, foundations should be watertight and ratproof. These qualities are assured if concrete is used. Concrete also provides a solid foundation, moderate in cost and one that can easily be built by ordinary labor under the direction of someone who understands the principles of concrete work. Our booklet "How to Make and Use Concrete" will be sent on request.

Soil conditions vary so greatly in different parts of the country and even in different locations on some farms that it is not possible to give definite details for foundation work which will meet all conditions. However, foundations should extend sufficiently below ground level to



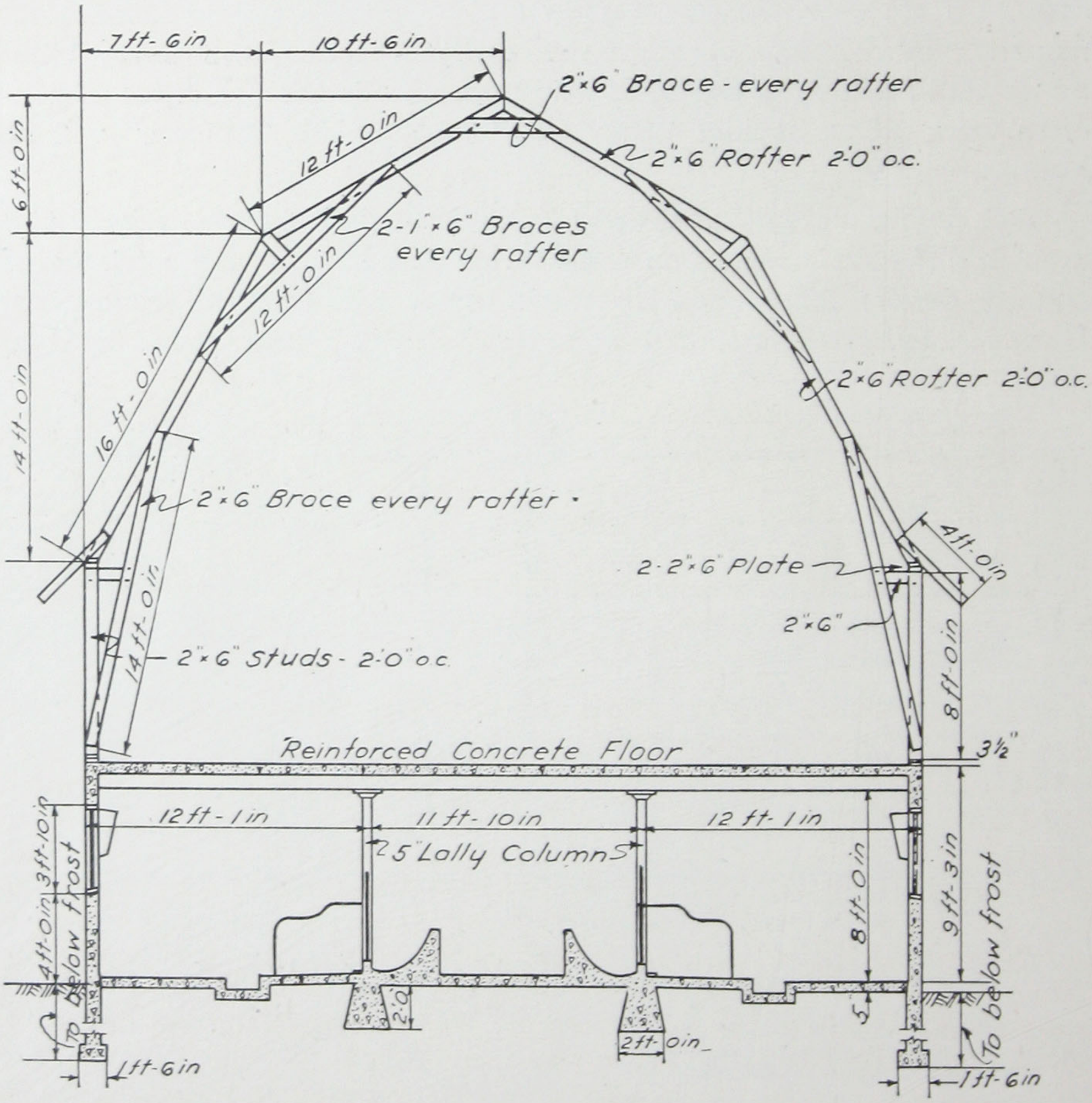
Suggested floor plan for general purpose barn. Cross section through the cow stalls of this barn is shown on the following page

reach good firm bearing soil and at the same time be below possible disturbance from upheaval due to frost. For barn walls a footing two feet wide and one foot high is generally sufficient. Details of foundation construction will be found in our booklet "Concrete Foundations," which will be sent free on request. It contains plans and instructions which are valuable to every person who contemplates building a structure requiring a foundation.

WALLS

For barn walls, monolithic (solid) concrete or the concrete building units known as concrete block and concrete structural tile are most

satisfactory. Not only is such construction economical, fireproof and permanent, but the resulting wall surfaces will be highly sanitary. Such walls can be washed, disinfected with germicidal solutions if necessary, and will not rot nor contribute to a damp interior. Such walls



A rigid type of barn framing that will insure a maximum amount of loft room. The concrete floor eliminates danger to herd from loft fires

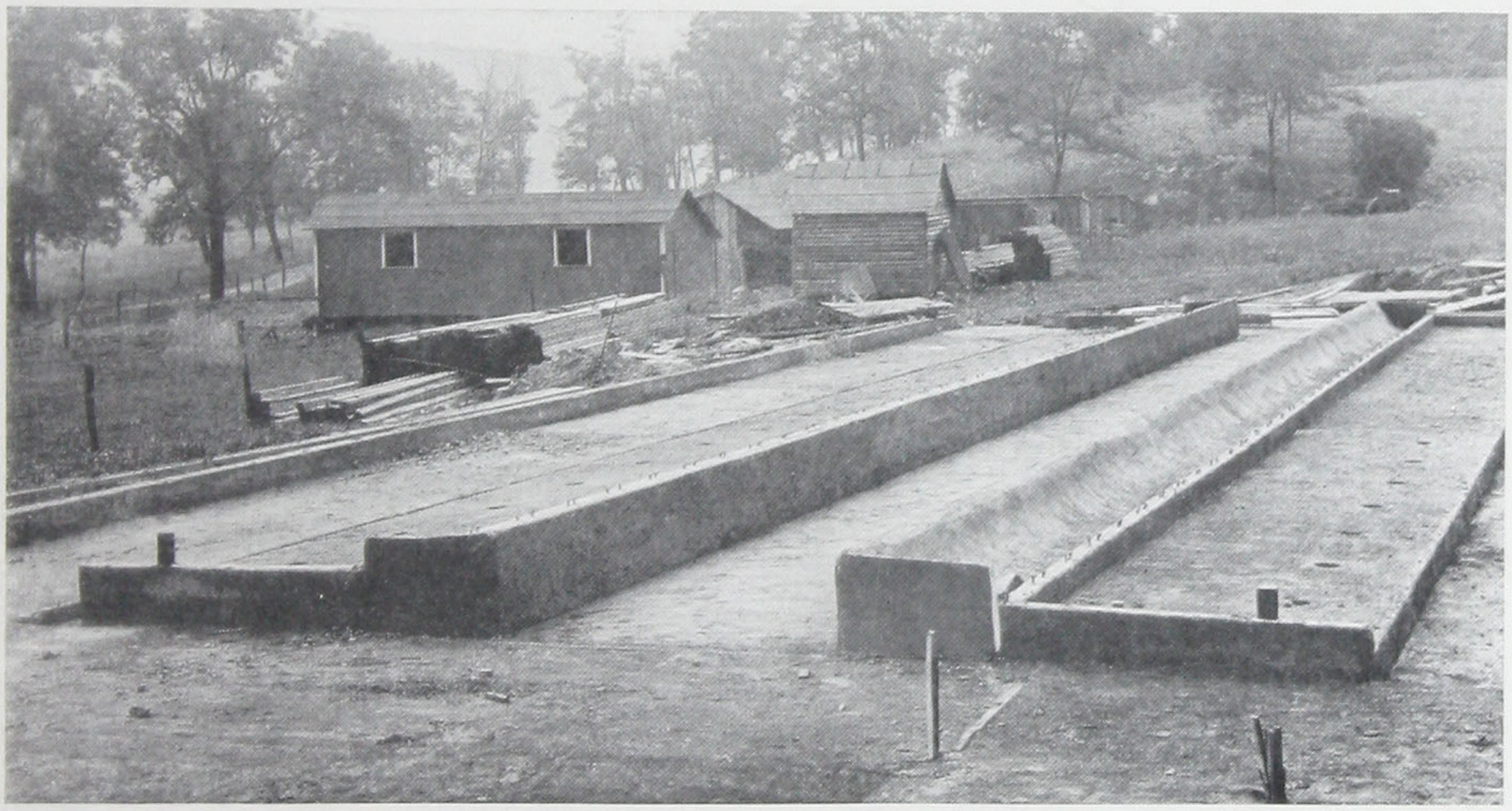
require neither paint nor repair, thereby eliminating future maintenance expense.

A good ceiling height for the average dairy barn is eight and one-half feet. A greater height than this is a disadvantage, principally because it makes it more difficult to keep stock quarters at proper temperatures in extremely cold weather as well as taking valuable enclosed space.

FLOOR CONSTRUCTION

After barn walls have been built, all rubbish and refuse within the enclosure should be removed and the floor area graded to the required level, allowing of course for the thickness of the concrete floor. The soil

where the concrete is to be laid should be thoroughly compacted. If the location is such as to make it possible for water to get under the floor at any time, this possibility should be reduced by using a fill of clean gravel, cinders or crushed stone and providing suitable drainage for this fill. The



Concrete in place for manger, stall, wall foundation, gutter and alley way, with fittings set for attaching stall and other fixtures

gravel or cinder sub-base, if used, must also be thoroughly compacted and consolidated by tamping or rolling.

Forms for defining floor slabs, alleyways or other areas to be concreted should be of smooth lumber, rigidly braced in line and carefully set to proper grade. The manger curb is usually placed first. It should be not less than four inches thick and is usually made about six inches high on the stall side. Uprights supporting stanchions are of several types. Some are attached to anchors which are set in the curb and others are embedded in the concrete. The latter type must be set in line and carefully plumbed before placing concrete. One manufacturer has devised a clamp to bolt over the curb and support the stanchion.

Feed and litter alleys are usually placed after the curb, then the stall platform and manger are placed.

The length of stall platform, that is, the distance from manger curb to gutter, will depend upon the breed of cattle kept. For Jerseys or Guernseys the average length is about four feet eight inches: for Holsteins about five feet is necessary. The platform should be pitched about one inch from the curb toward the gutter.

Where stall partitions are erected after the concrete platform is placed, holes about six inches in diameter must be left in the platform at intervals equal to the width of the stall, which is usually three feet six inches. After stall partitions are erected, these holes are filled with cement-mortar which is sloped up about an inch above floor level so as to drain liquids away from the steel, thereby protecting it from rust. If stalls are to be paved with cork or other block, allowance must be made for the

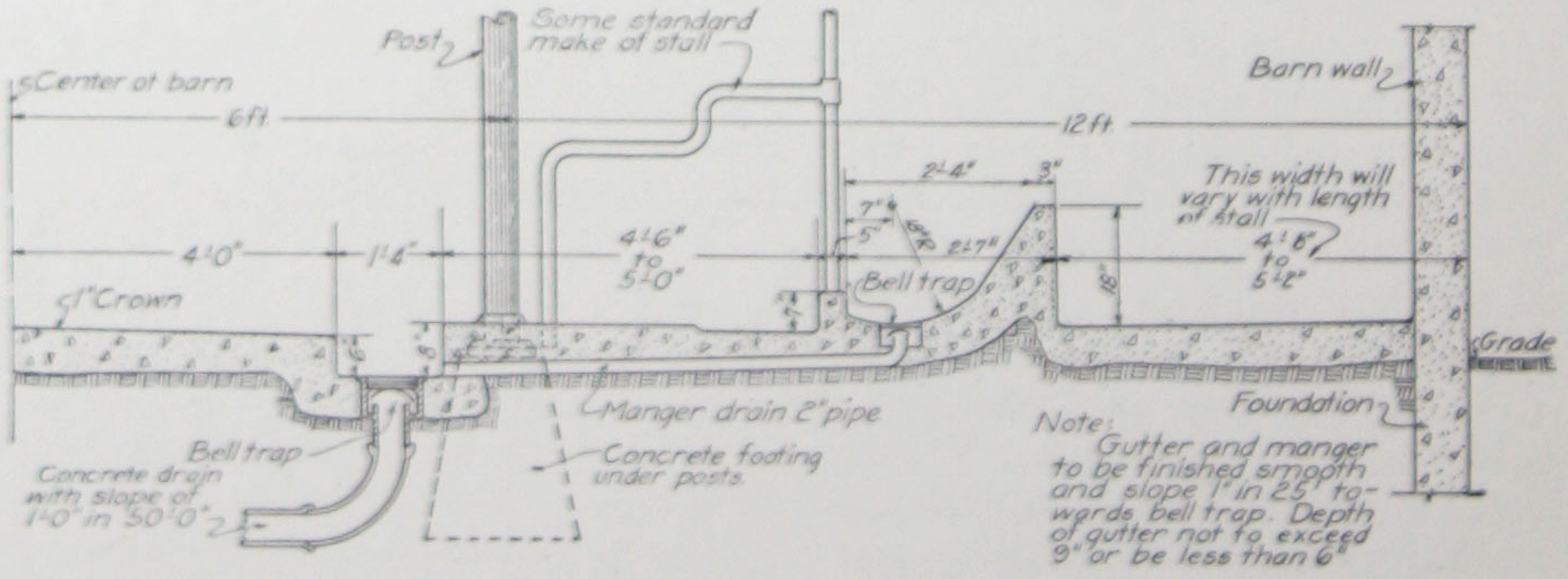
Concrete construction on the dairy farm makes for healthy, contented cows, greater milk production and larger milk checks

thickness of the block, plus one-half inch for cement-mortar in which they are embedded. In such a case a four-inch curb should be finished on the gutter side.

An illustration on this page shows in cross-section a design of dairy barn floor, stall and manger, based on best practice. By using a manger pattern or templet, the feed trough can be easily and evenly finished.

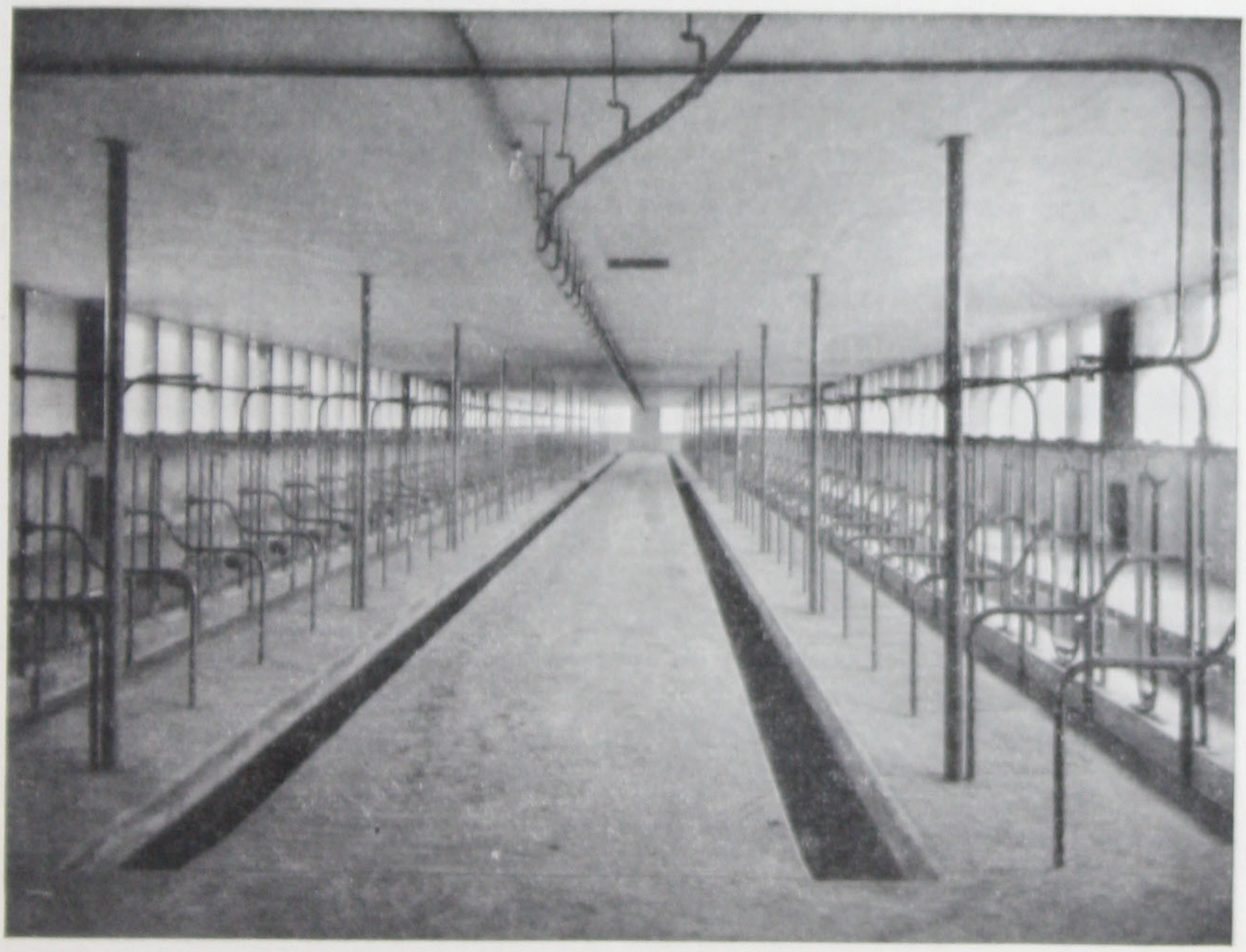
MIXING AND PLACING CONCRETE

The mixture recommended for concrete barn floors is one sack of portland cement to two cubic feet of sand and three cubic feet of pebbles or broken stone. This is commonly called a 1 : 2 : 3 mixture. Sand should be clean and well graded in size from fine particles up to one-quarter inch. Pebbles or broken stone should be clean, hard and range in size from one-quarter to one and one-half inches. One-course construction is recommended, which means that the required thickness of concrete is placed in one operation.



Half cross section of a well-designed dairy barn, showing dimensions based on best practice

Many persons have the impression that when definite proportions of sand and pebbles are specified, the same results can be obtained by substituting for them an equal bulk of bank-run material, that is sand and pebbles as found combined in the ordinary gravel pit. This is incorrect. There is almost invariably an excess of sand in natural deposits of gravel and such materials should never be used for concrete until screened and



The modern dairy barn is neat in appearance, sanitary, safe for the stock and economical in space as well as in cost of construction and maintenance

the fine and coarse materials (sand and pebbles) have been separated and then in turn correctly reproportioned.

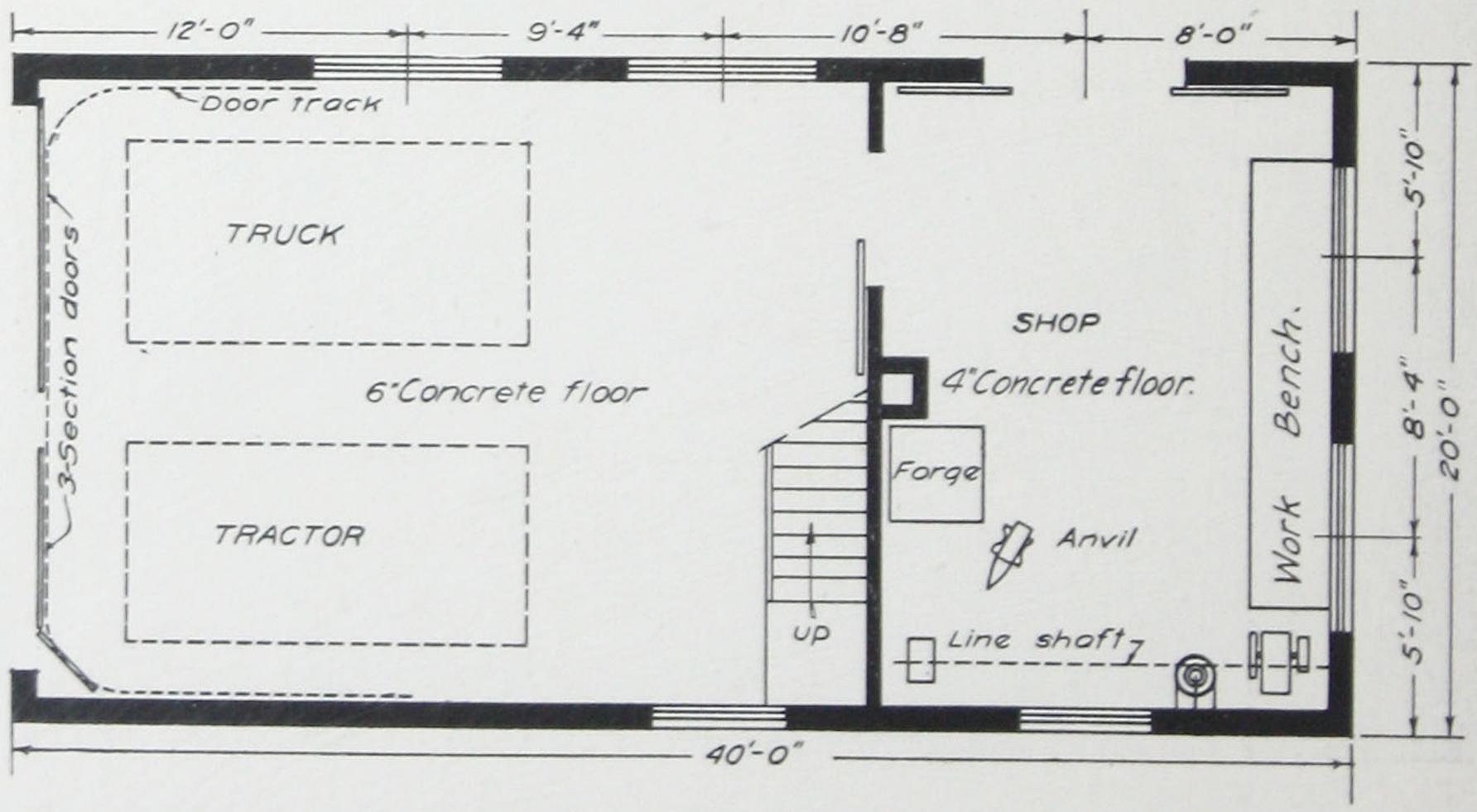
In mixing the correctly proportioned materials for one-course construction, only enough water should be added to produce a mixture of quaky or jellylike consistency. Concrete of such consistency can usually be settled into place and easily leveled with a strikeboard resting upon the top edge of forms. This should be passed across the surface with a sawlike motion and each time advanced a little, thus leveling the concrete and at the same time assisting to compact it.

The surface of the manger should be finished smooth, with corners carefully rounded to make cleaning out easy and to provide a comfortable surface for the animals to eat from. Litter and feed alleys should be finished with a wood float to secure an even but gritty surface, thus providing secure footing for the animals. Alleys should be pitched one-quarter inch to the foot toward a gutter connecting with a drain leading to a concrete manure pit or cistern.

A Combination Tractor Shed and Farm Workshop

A tractor and motor truck, now considered necessities on every well-equipped dairy farm, will, if given proper care, render useful service for many years. A well-built shelter furnishes protection from the elements and, if carefully planned, will also afford a workshop where all repairing and overhauling may be done.

To provide proper shelter a tractor house should be dry, fireproof and of permanent construction. In a damp building rust will play havoc with the iron and steel machine parts. Because of the oily rags and



Floor plan of combination tractor shed and workshop. The shop is large enough to permit of repairing any ordinary farm implement

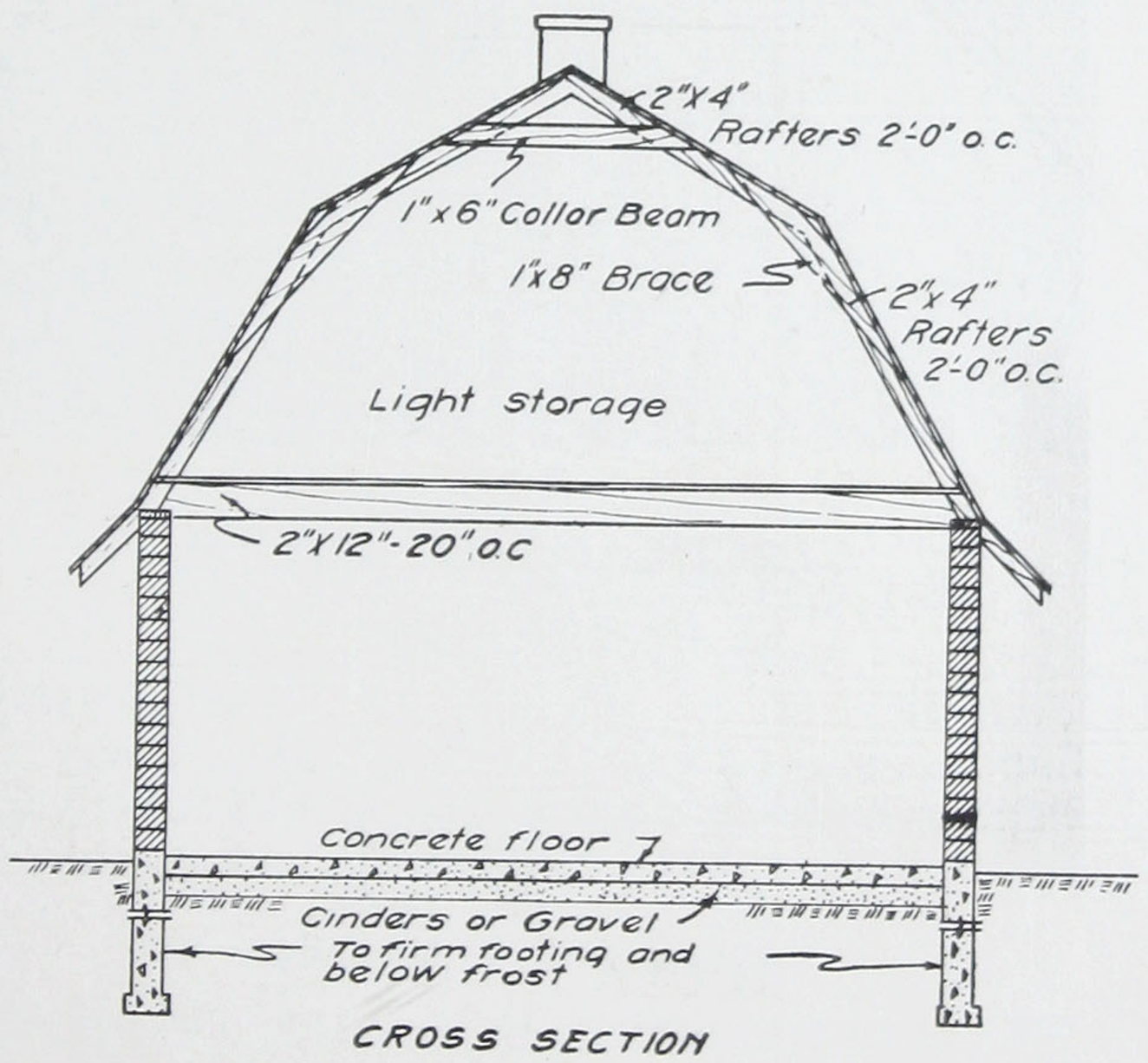
waste always present around such structures, and because of the highly inflammable nature of the oils and gas used in the machines, fireproof construction is an absolute necessity. A concrete structure fulfills all the requirements of a fireproof machinery house, and besides, is low in first cost and economical in maintenance.

The concrete block structure here illustrated measures 20 by 40 feet, over one-third of which is devoted to the workshop. In this shop are a forge, anvil, work bench and other equipment needed in a place of this sort. A line shaft at one end operated by a small gasoline engine furnishes power for driving a lathe, drill press and other small machines that may be needed. The door leading to the shop is large enough so that any ordinary farm implement may be brought inside for repair. This feature will be especially appreciated during stormy weather and in winter. During the winter months farm machinery should be put in working order for the coming season. Careful overhauling of farm implements will

prevent many costly breakdowns in the field when time is valuable. A well equipped shop is a worth-while investment on any farm.

Two large sectional doors which can be folded back along the side allow ample room for driving truck and tractor into the shed.

The floor should be four inches thick in the workshop where no heavy load is to be carried, but should be six inches thick in the room where the truck and tractor are kept. The floor should be laid on a well-compacted fill of gravel or cinders to insure good underdrainage. Concrete mixed in the proportion of one sack of portland cement to two cubic feet of clean well-graded sand and three cubic feet of pebbles or broken stone, is recommended for the floor. The foundation and footings may be made of a concrete mixed in the proportion of 1:2½:4. A portland cement mortar mixed in the proportion of one sack of cement to two cubic feet of sand will be found most satisfactory for laying up the block wall. Slaked lime not to exceed 25 per cent by volume of the cement used may be added to this mortar.



A combination tractor shed and workshop—a necessity on every modern farm—puts farm work on a mechanically efficient basis

Milkhouses

In order that milk may be delivered to the consumer in a sweet, clean, sanitary condition, it must be kept cool until it can be taken to market. Milk is probably more susceptible to contamination than any other food product. It quickly absorbs disagreeable or objectionable odors to which exposed.

A small milkhouse separated from the barn is necessary so that milk will not be tainted by stable odors. Concrete construction, either monolithic or block, makes an ideal milkhouse. Such a structure should be conveniently located, which in most cases will be somewhere between the barn and the house and near a supply of water and the icehouse, if there is one on the farm.

CIRCULAR MILKHOUSE

Materials Required

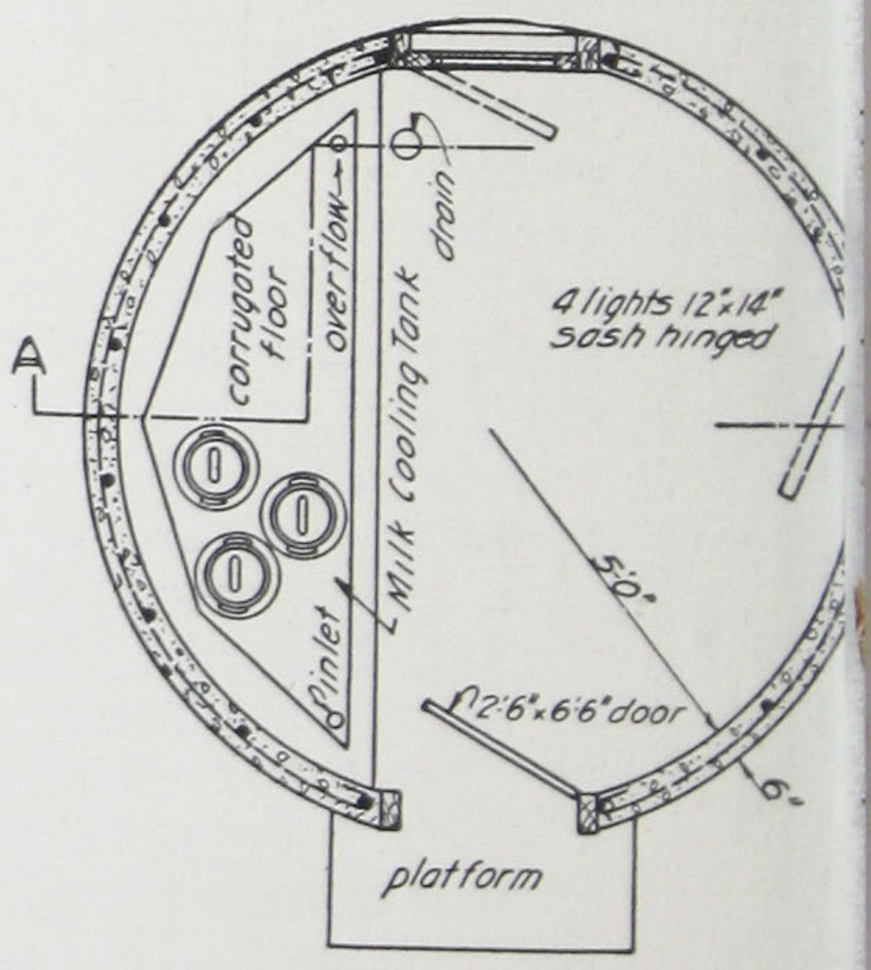
Cement . . . . . 61 sacks
Sand . . . . . 5½ cubic yards
Pebbles or broken stone . . . . . 8 cubic yards
Reinforcing steel . . . 805 feet ⅜-inch round rods

Concrete Mixtures:

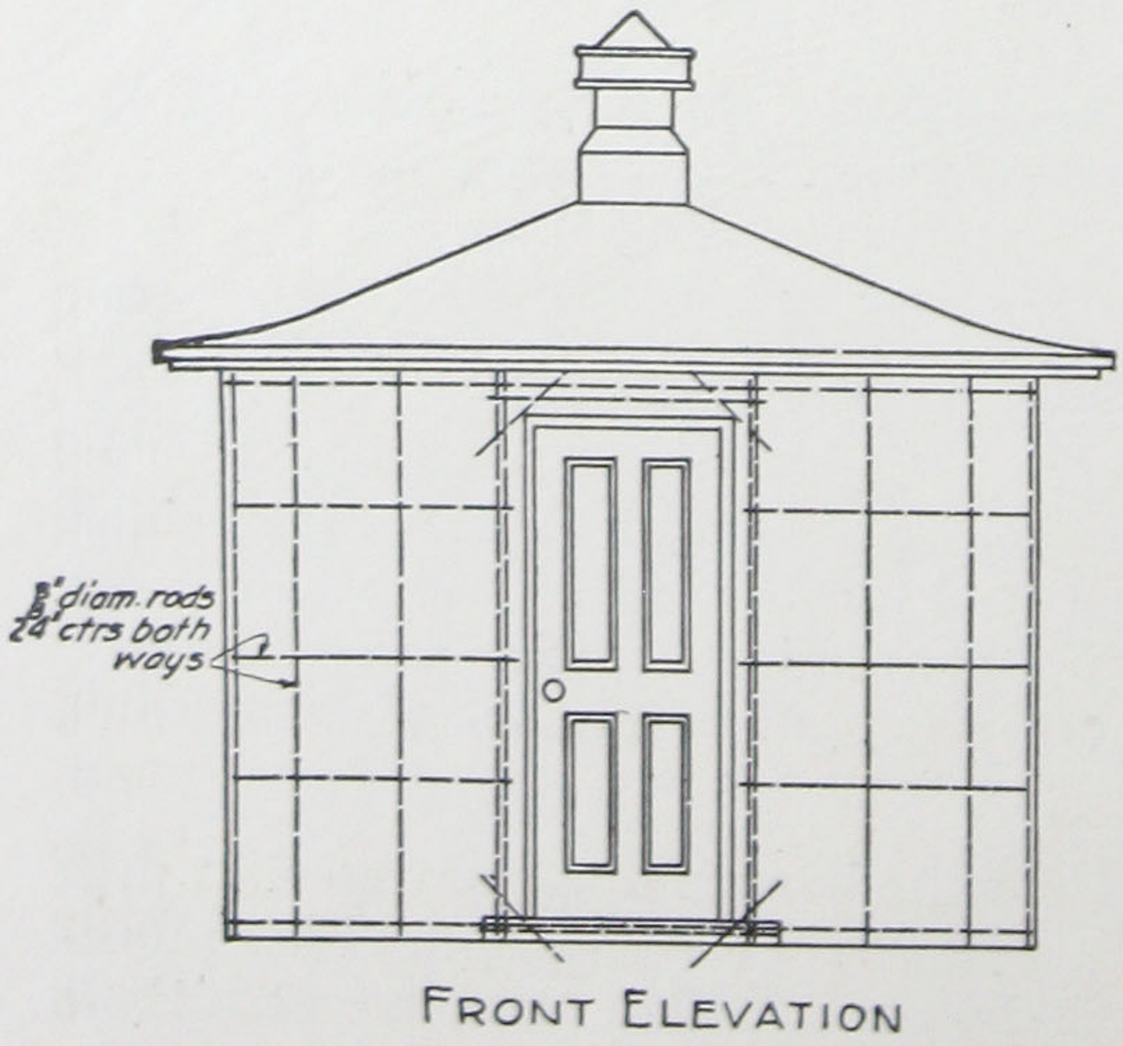
Walls and foundation 1:2½:4
Roof, floor and tank 1:2:3

Types

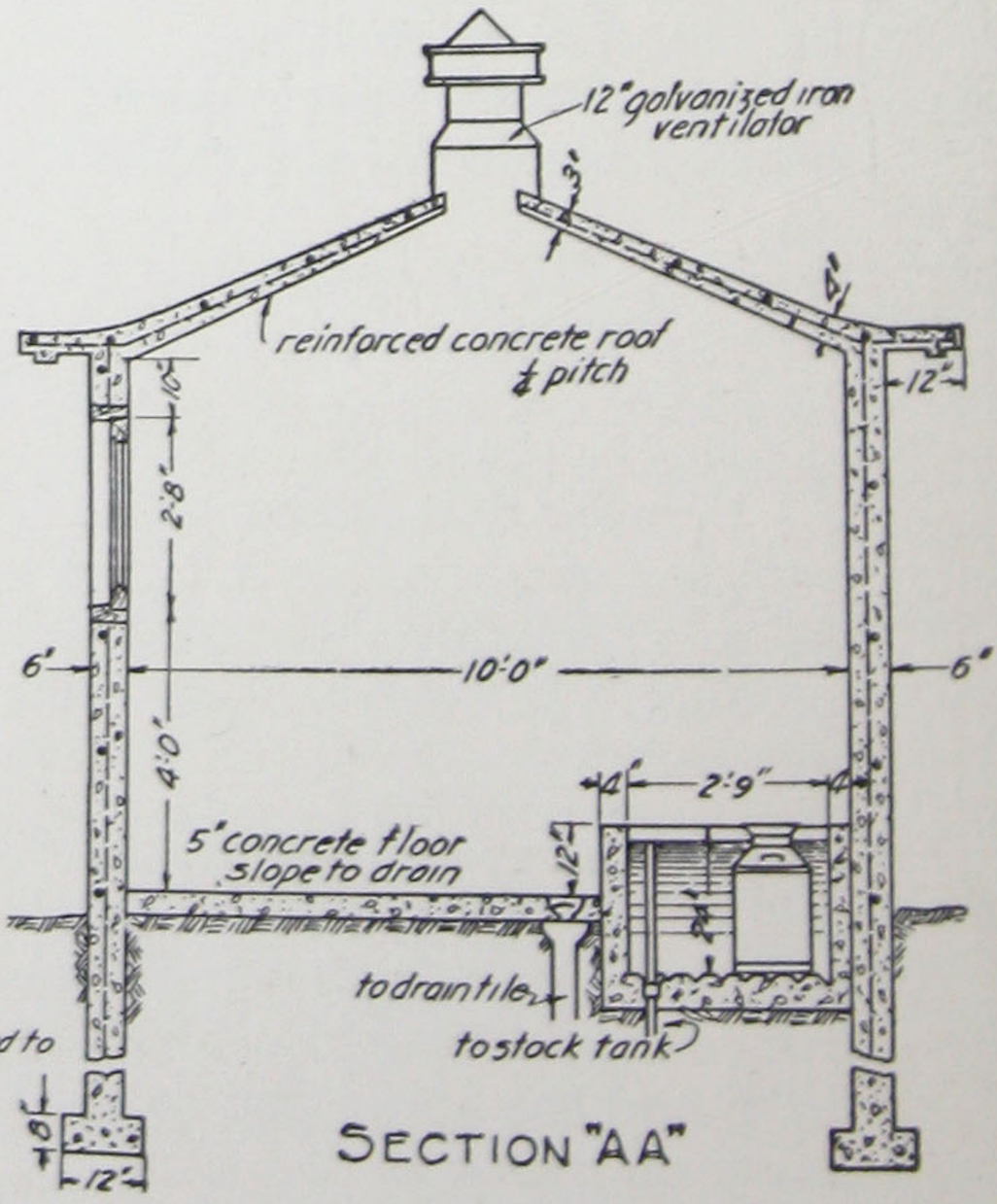
Plans shown in this booklet : one rectangular and the other shown can be built by using the building circular tanks or silos. using the type of concrete bloc houses shown in the plans ment so that they will not provide s various kinds, which would soo itary. The milkhouse should l only.



FLOOR PLAN



FRONT ELEVATION



SECTION "AA"

Milkhouses

rate two types of concrete milkhouses,
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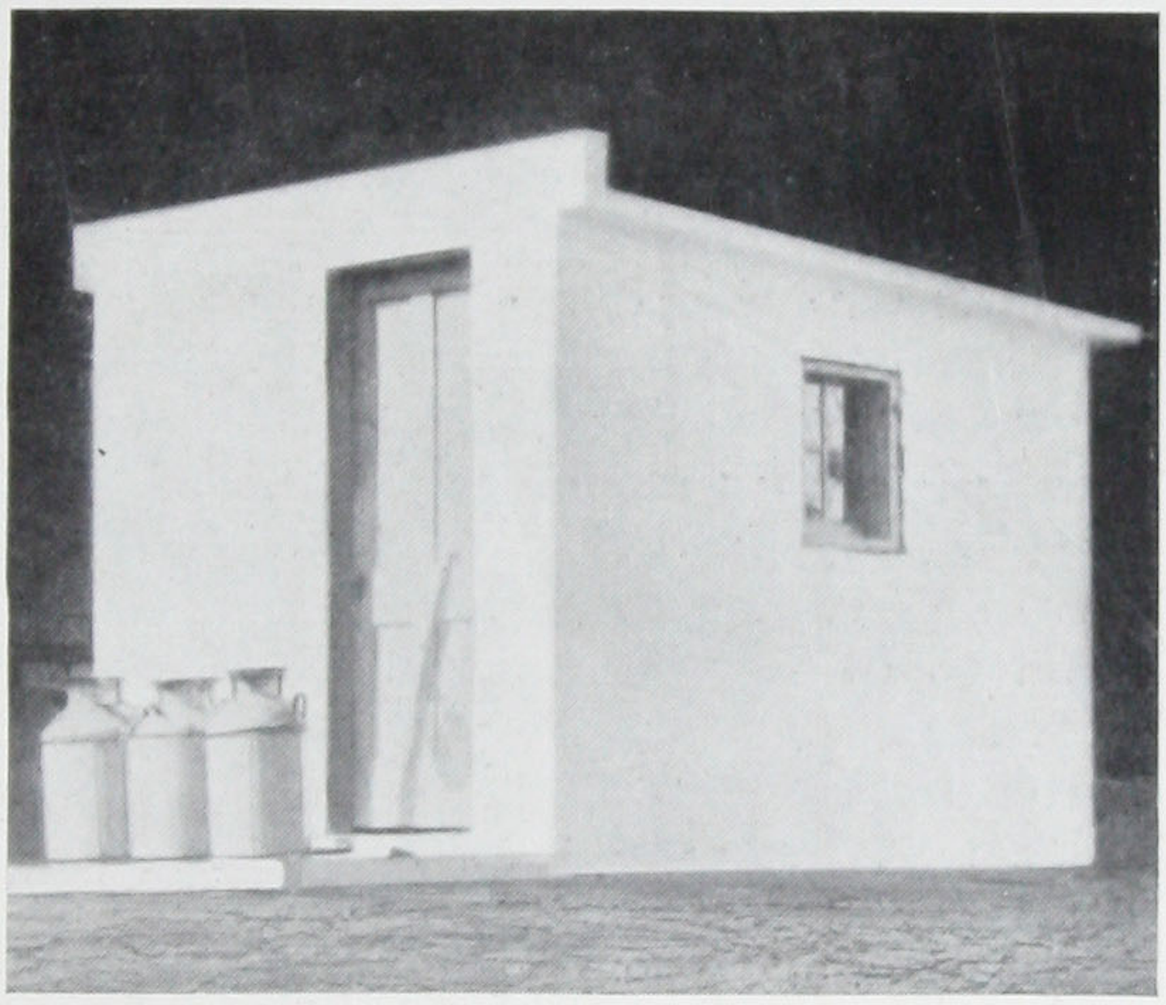


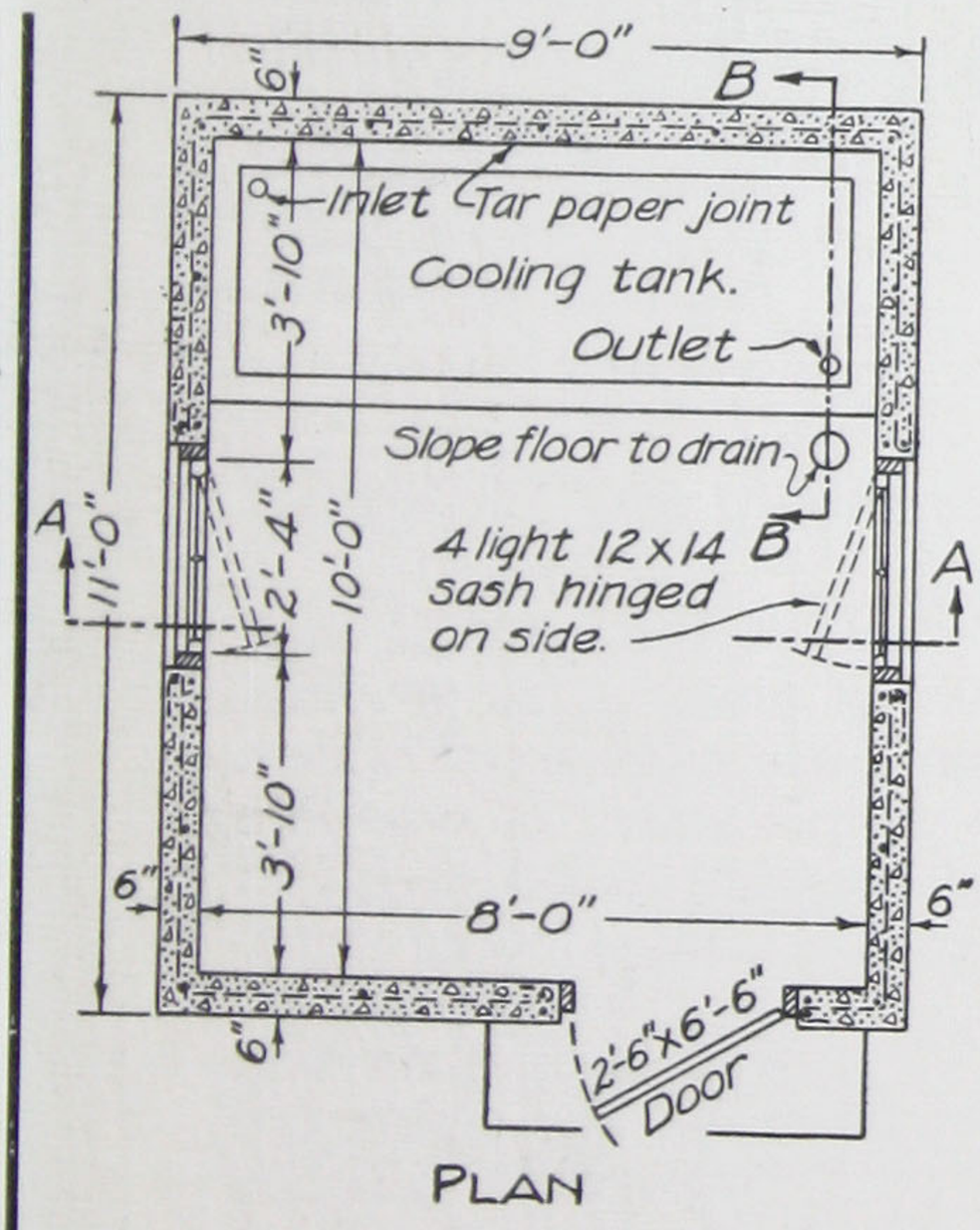
RECTANGULAR MILKHOUSE

Materials Required

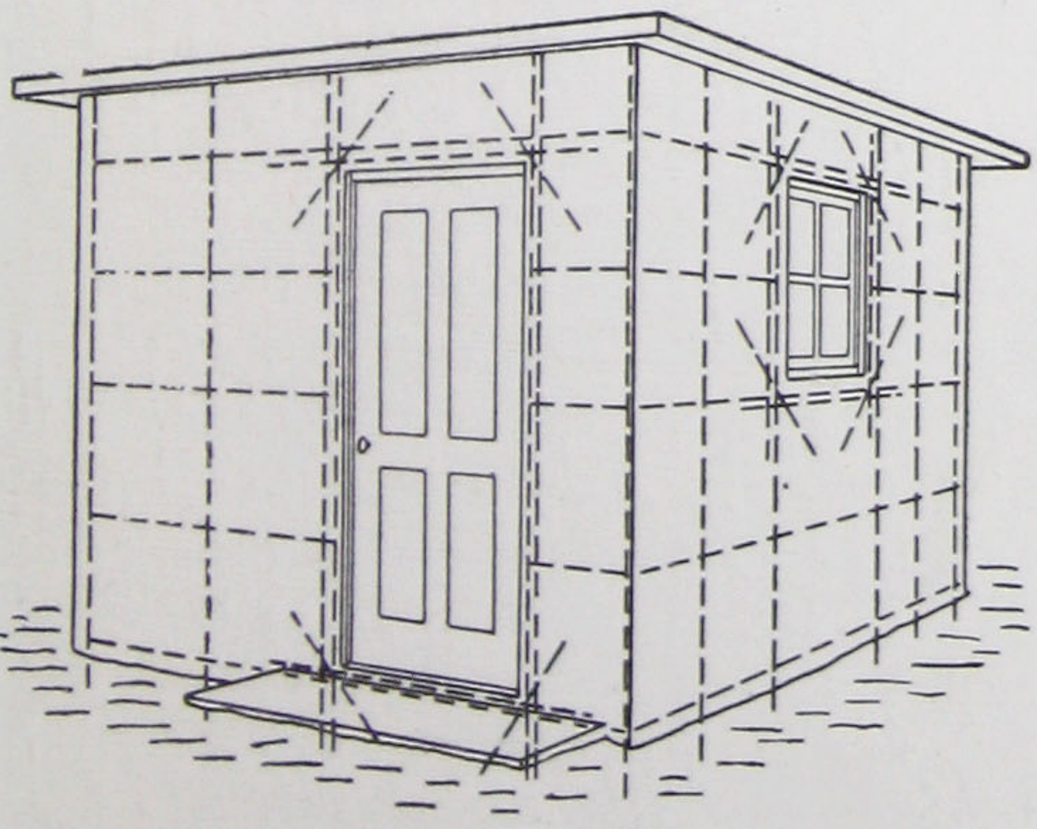
Cement	62 sacks
Sand	5⅔ cubic yards
Pebbles or broken stone	9 cubic yards
Reinforcing steel, 975 ft.	⅜-inch round rods

Concrete Mixtures:

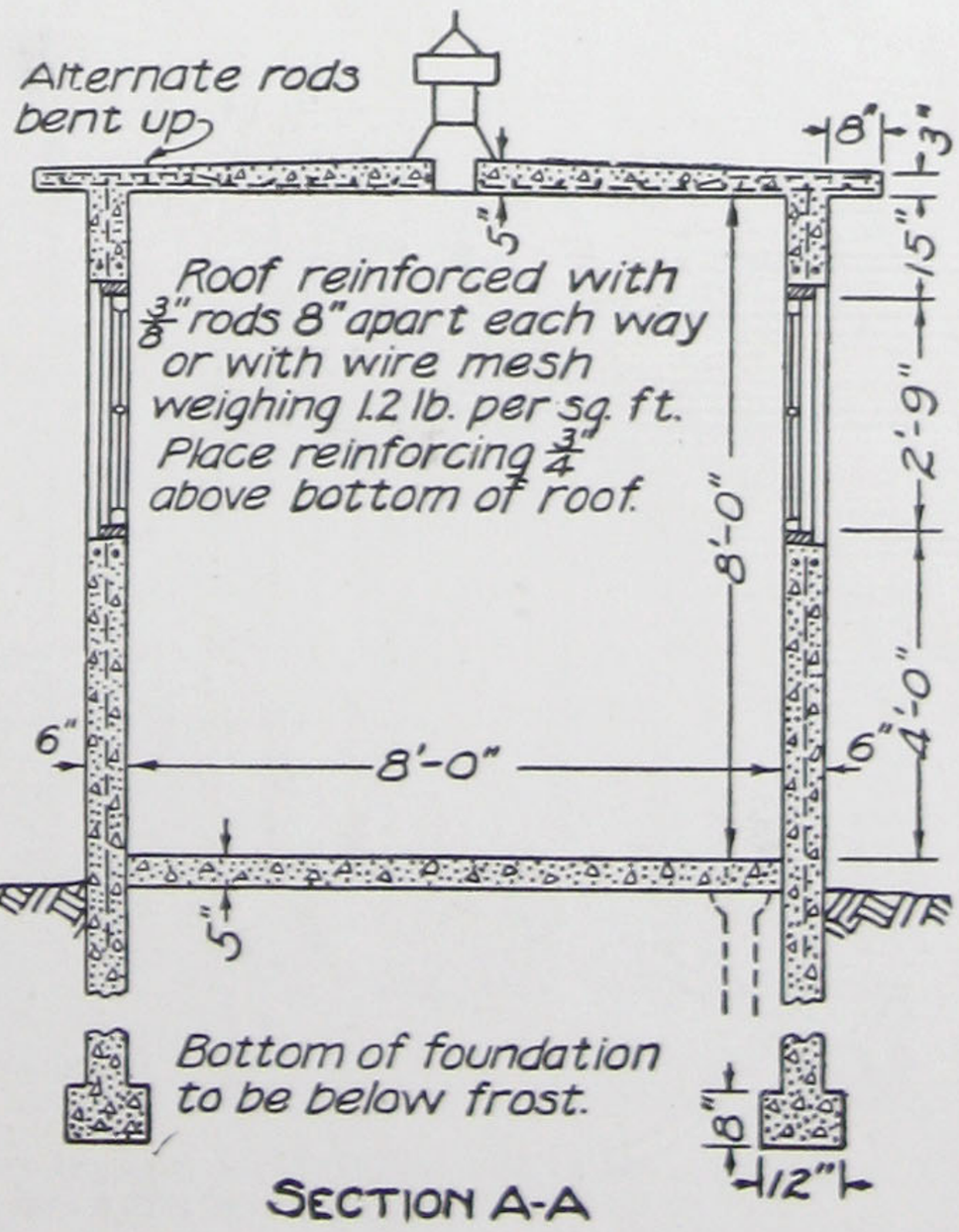
Foundation	1:3:5
Walls above ground	1:2½:4
Roof, tank and floor	1:2:3



PLAN



Wall reinforced with ⅜" round rods as shown. Rods doubled around openings and continous around corners. Diagonal rods 2'-6" long at corners of openings.

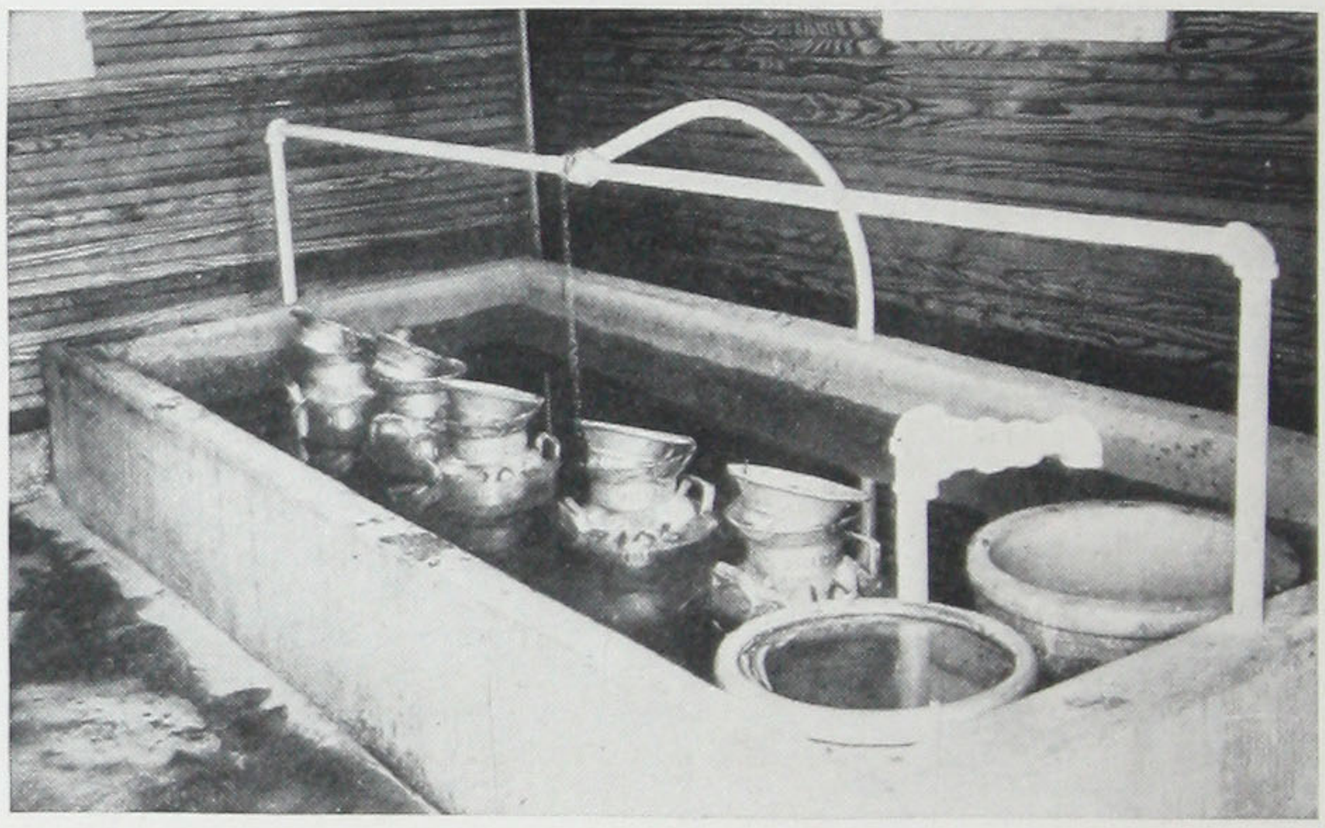


Bottom of foundation to be below frost.

SECTION A-A

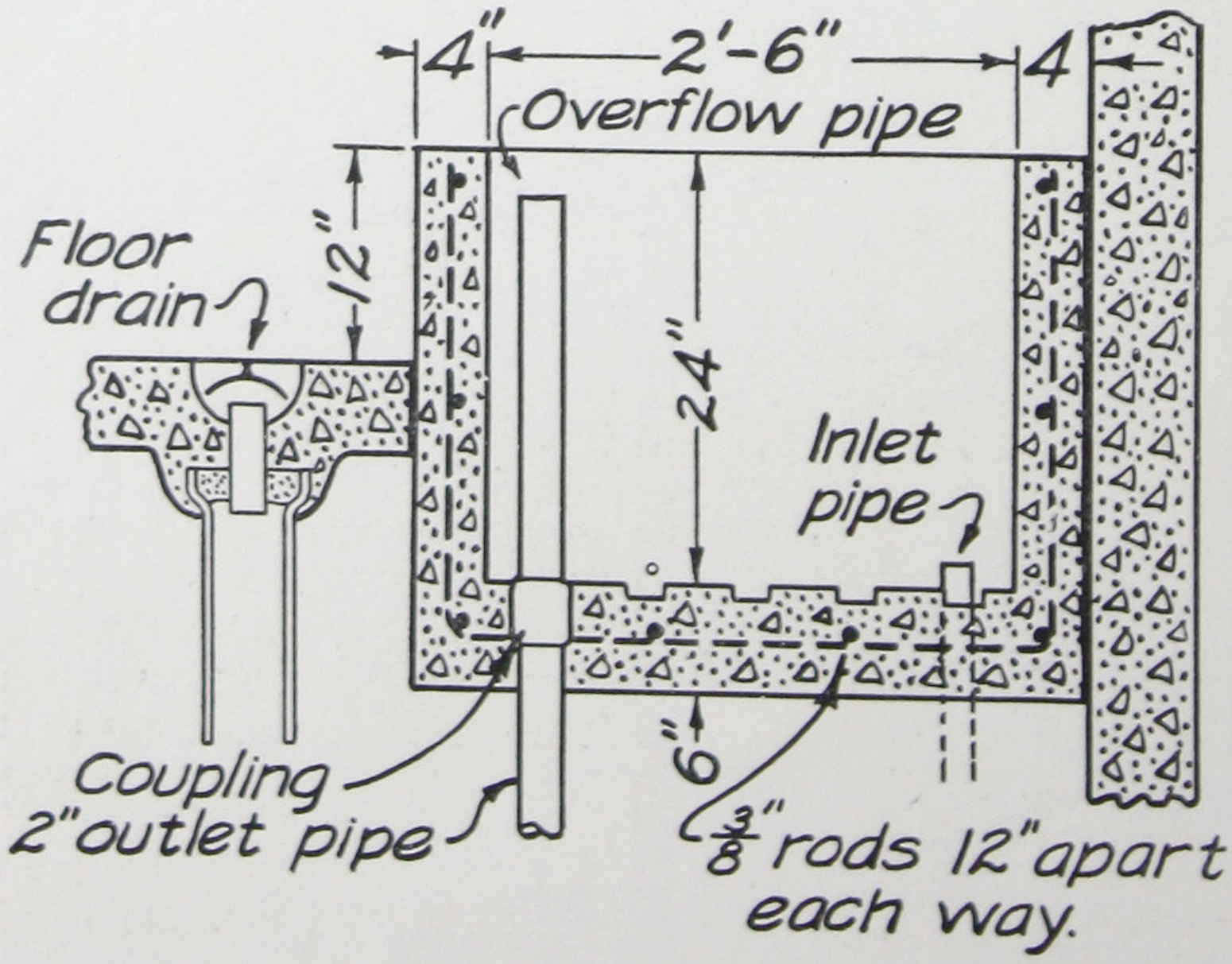
COOLING TANKS

Each of the milkhouse plans shown provides for a concrete cooling tank. The height of cans governs the depth of tank and it is desirable to have cans stand as much submerged as possible. The length of the overflow pipe is also regulated by height of cans (depth of water to be provided in the tank). Water should come well up on the necks of the cans. If ice is not available on the farm, milk can be kept cool by circulating spring water through the tank. This will usually keep milk at a temperature of fifty-five degrees Fahrenheit or lower.



A concrete cooling tank for the dairy is easily constructed when a concrete milkhouse is built

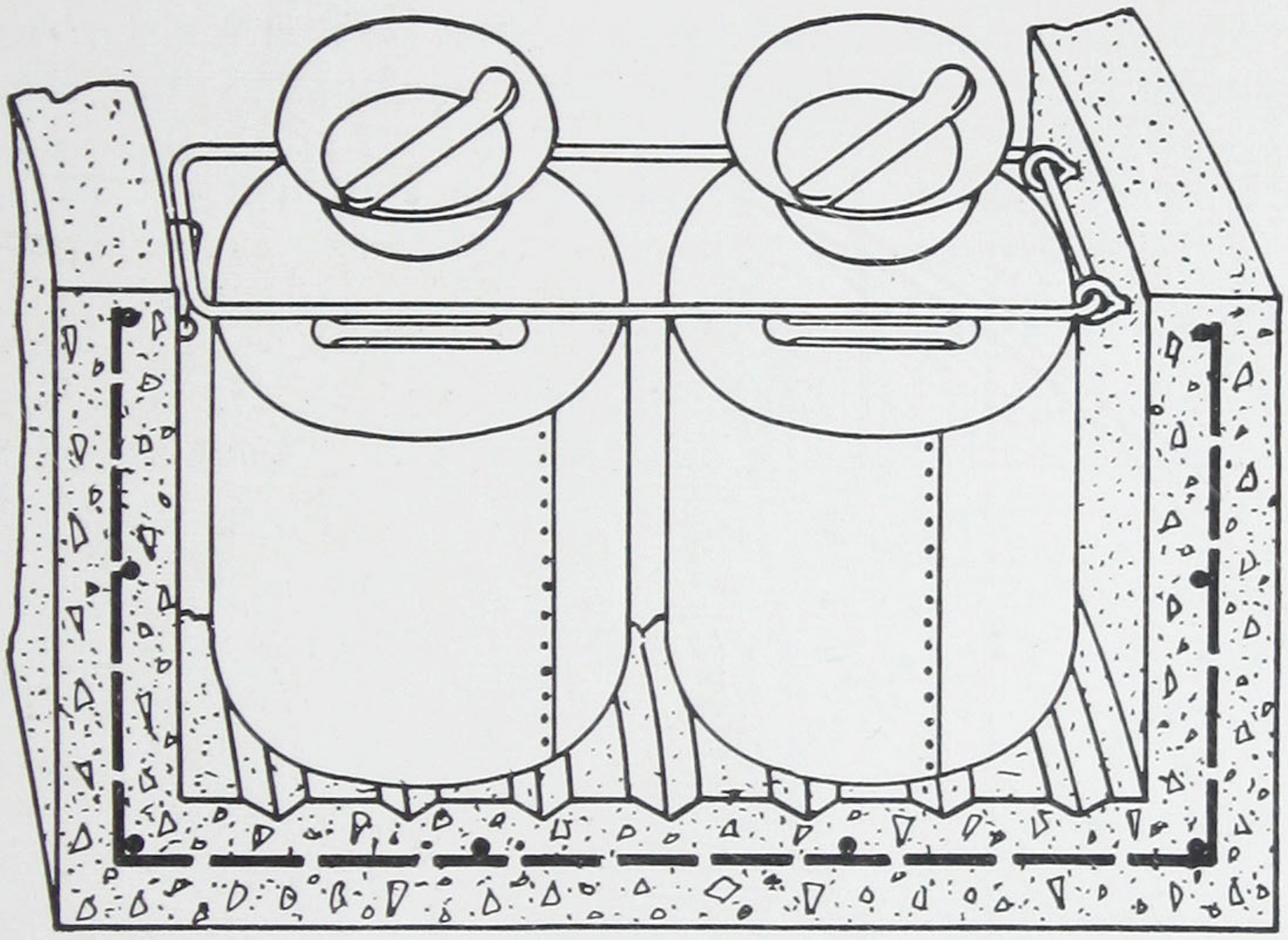
In the design shown, water enters at one end of the tank at floor level and leaves at the opposite end by the outlet pipe. This provides suitable circulation, insuring continually uniform change of water. The grooves shown in the tank floor are to permit water to circulate under the cans. Such grooves are made by pressing wood strips in the concrete before it has hardened and after the tank floor has been brought to proper surface. The strips are removed before the floor has completely hardened.



Section of concrete milk cooling tank, showing method of locating and setting inlet and overflow pipes and location of floor drain

To lighten the labor of lifting and moving cans in and out of the tank, part of its depth is below floor level. For the same reason the width of the tank is limited to the diameter of two cans or convenient

arm's reach. A device for holding the cans properly submerged when they do not contain enough milk (weight) to make them submerge naturally, is shown in the accompanying sketch. This device keeps partly filled cans from overturning and spilling their contents. It is easily installed, inexpensive and a safeguard to dairy products.



Part section of concrete milk cooling tank, showing device for holding cans in the tank. The eye bolts should be placed in the wall about 21 inches from the bottom of the tank, depending upon style of can used

Icehouses

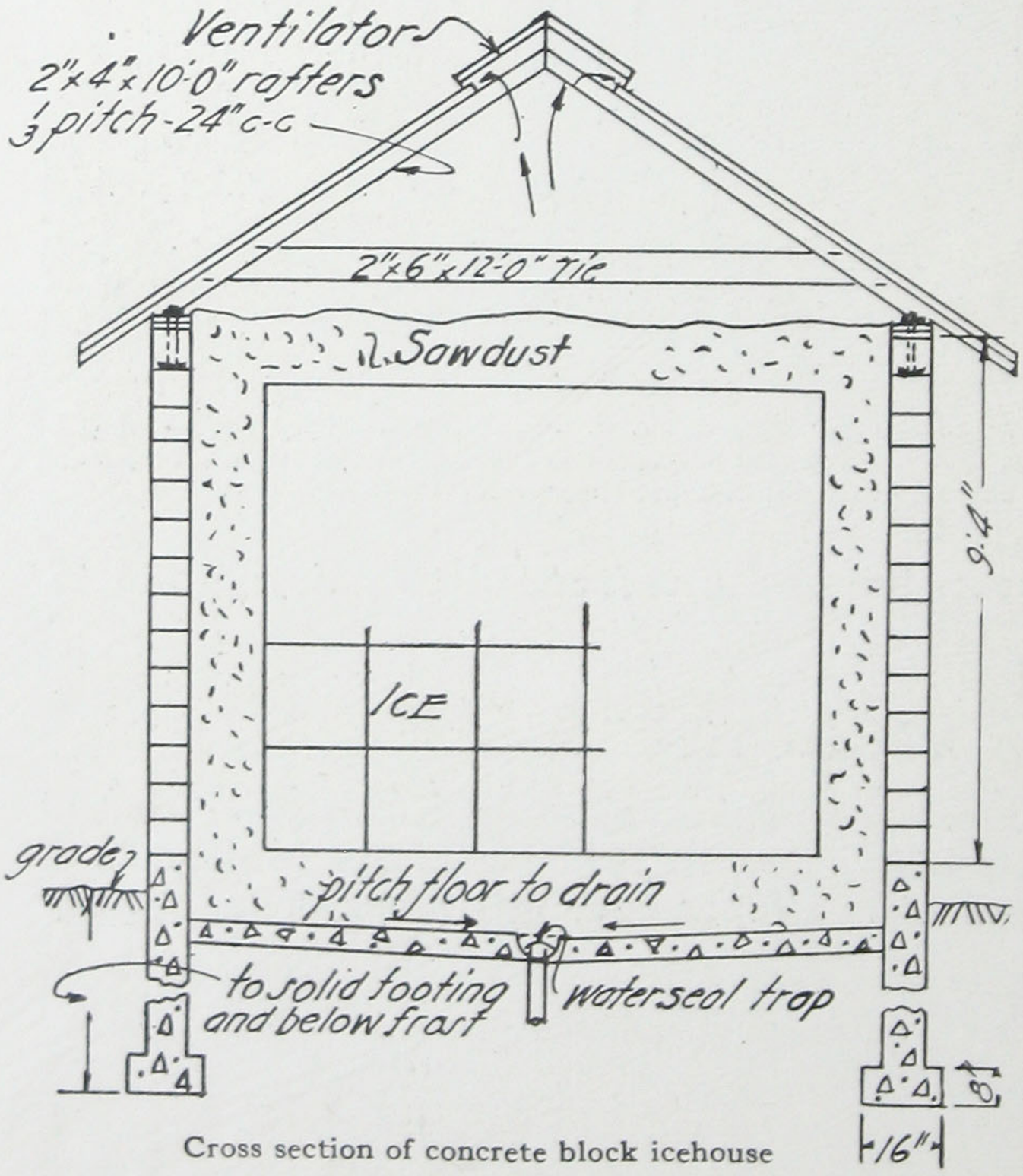
Government investigations have shown that about thirty per cent of all dairy products are a loss before they leave the farm due to absence of or inadequate cooling facilities. Proper cooling by use of ice greatly

When other conditions permit, the milkhouse should be located near the icehouse and the supply of ice thus made conveniently available for cooling the milk

reduces this waste, and ice can often be had for the cost of harvesting during the season when farm labor has least to do. Many farmers have found that a small icehouse will pay for itself in from one to two years in terms of milk and other perishable products prevented from spoiling by its use.

CONSTRUCTION MATERIALS

Monolithic concrete and concrete block are both ideal materials for icehouse construction. They are not only economical in first cost, but result in permanent structures which require no maintenance or at most only a minimum. Icehouses are always damp and concrete is not susceptible to rot or other forms of depreciation. The air spaces in the wall, resulting from the use of concrete block, provide good insulation against summer heat, so loss from melting is small. Fire is seldom thought of in connection with an icehouse, yet spontaneous combustion frequently occurs due to heat generated by changing conditions of moisture in the packing materials. Concrete icehouses give full measure of fire protection.



Cross section of concrete block icehouse

SIZE

When planning an icehouse, the quantity of ice required should be determined and capacity of the structure made to conform. In northern states it is common practice to store one and one-half tons of ice for cooling the milk from each cow during the summer. The exact amount to be stored may be found by multiplying this figure by the number of cows in the herd. In other words, to cool the milk from ten cows would require ice storage capacity of fifteen tons. In the southern states two tons per cow is usually required. If cream only is to be cooled, one-half ton per cow should be sufficient. It is also well to increase the amount stored so that several tons may be available for use in the home refrigerator. Loss from melting in storage should also be allowed for. This will vary in accordance with the type of construction and the care used to pack the ice. An allowance of twenty-five per cent for shrinkage due to melting will usually be sufficient.

PACKING

Ice should be packed in as nearly a cubical mass as possible so as to keep low the losses from melting.

An accompanying illustration shows a small concrete block icehouse having a capacity of between 20 and 25 tons. A circular monolithic icehouse may be built by using ordinary silo forms. Plans can be adapted to build a larger icehouse if desired.

A concrete icehouse keeps ice perfectly and in addition safeguards against fires from spontaneous combustion, which often start in materials used for packing ice

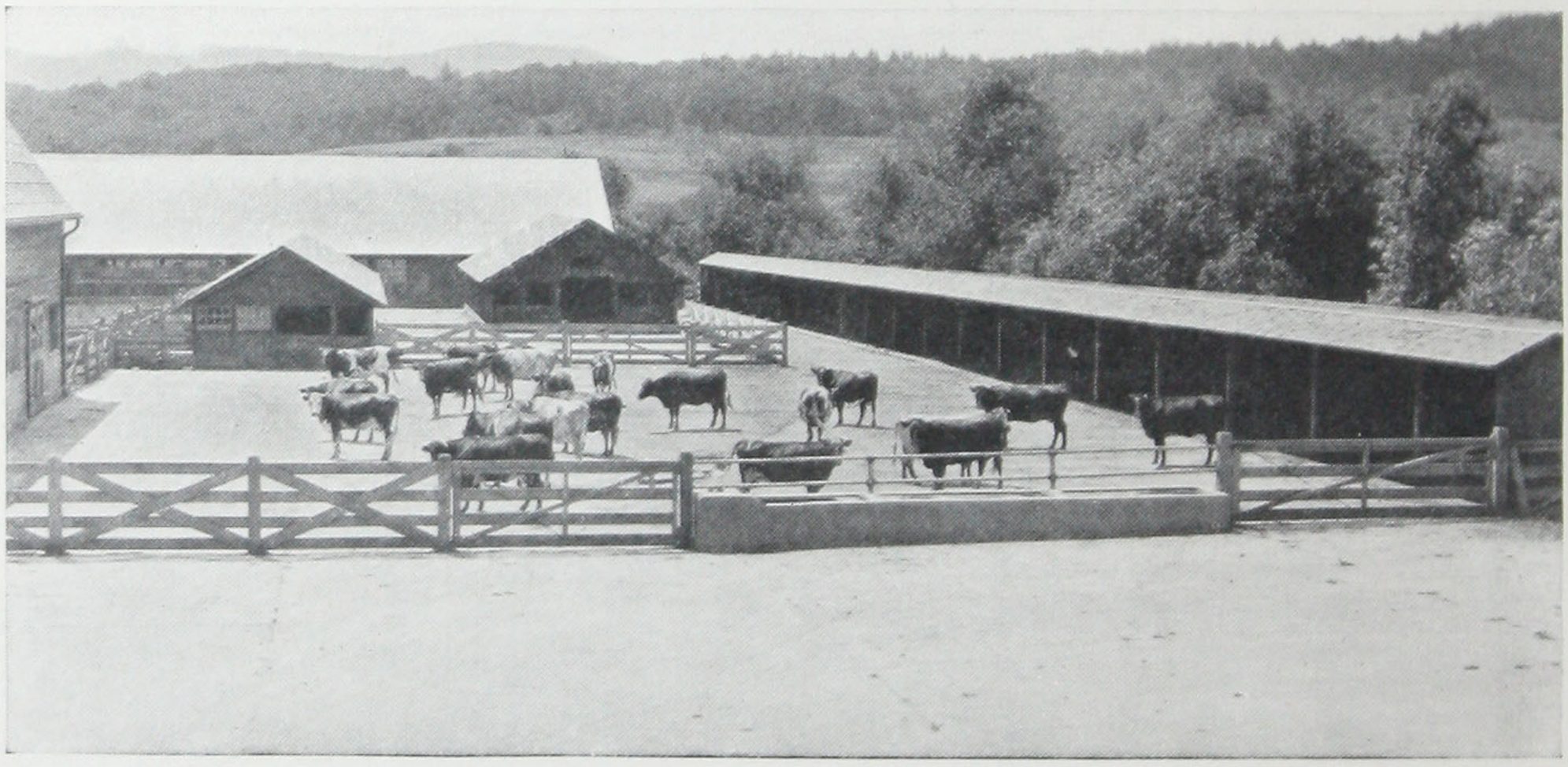
At least 12 inches should be allowed on all sides and on top and bottom for sawdust or some other form of packing or insulating material. Between 40 and 50 cubic feet of space are required for one ton of packed ice. The figures in the following table give the approximate capacity of icehouses of eleven different sizes. These figures have taken into consideration the space occupied by packing material 12 inches thick, recommended to be used around sides, top and bottom.

Capacity of Icehouses

Height in Feet	Width in Feet	Length in Feet	Capacity in Tons
10	12	12	18
10	12	16	25
10	14	16	30
12	12	18	35
12	14	18	43
12	16	18	50
12	16	22	62
12	18	22	71
14	16	24	82
14	18	24	94
14	20	24	105

Concrete Paved Barnyards

In all parts of the country sanitary pavements of concrete are doing away with the unsightly mudholes once so common to barnyards. No matter how well an unpaved barnyard may be cared for, there are some seasons of the year during which it is not only muddy but filthy. This results in dirty milk, because no matter how well stock may



A barnyard paved with concrete is clean and dry no matter what the weather may be. It saves valuable manures and makes an economical feeding place for stock of all kinds

be cleaned they cannot be kept as clean if they must exercise in a muddy barnyard as when they have the advantages of a concrete pavement. In addition, the concrete paved barnyard prevents waste of manure.

Tests made at the Ohio Experiment Station to determine the relative value of manure removed from a concrete floor as compared with that taken from an unpaved yard, proved that not only was more manure saved from the paved floor but that the quantity saved contained a higher percentage of phosphorus, potash and nitrogen.

Concrete barnyard pavements are easy to build. Anyone who has had a limited amount of experience in concrete work can successfully tackle the job, and the man who has never had experience can acquire what is necessary in a short time by carefully following a few simple instructions. Not all of the pavement need be built at one time, but a strip at least twenty feet wide should be laid adjoining the barn. Additional strips can be added as desired.

CONSTRUCTION DETAILS

Two types of construction may be used for barnyard pavements, one and two-course, as described elsewhere under floors. However, the one-course construction is preferable. This is placed in one operation to the

required thickness. A 1 : 2 : 3 mixture should be used. By 1 : 2 : 3 mixture is meant one sack of portland cement to two cubic feet of clean, well graded sand and three cubic feet of clean gravel or broken stone. Same care in grading of materials as recommended under floors.

The barnyard pavement should have a slope of one-fourth inch to the foot toward a gutter molded in one side of the pavement. This gutter will save liquid wastes dropped on the floor by draining them to a cistern or manure pit with which the floor should be connected.

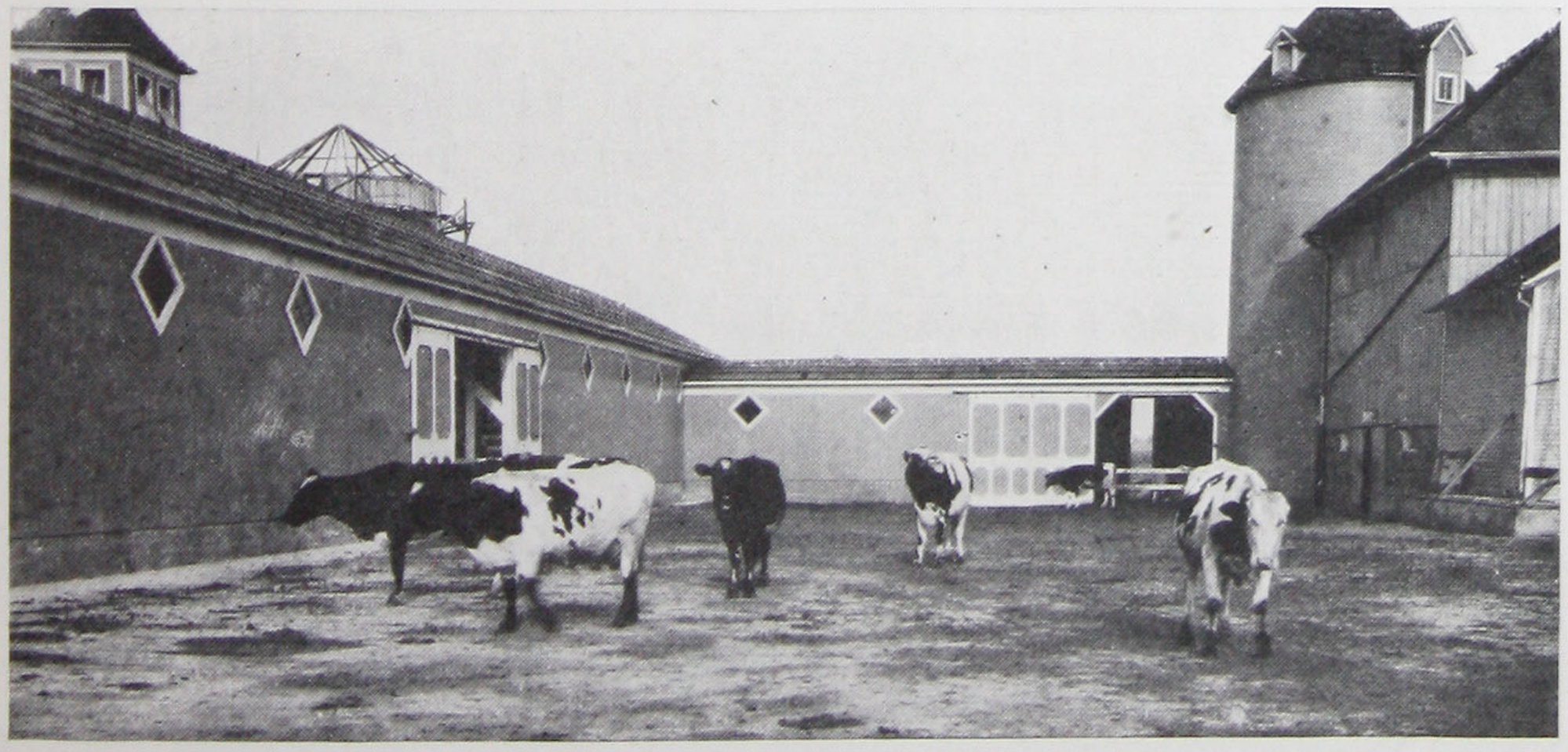
Slabs of a barnyard pavement should be limited to not more than ten feet square. Forms should preferably be of two-inch lumber, four or five inches wide, depending upon thickness of the pavement. The top of the forms should be set to such a grade that a slope of one-fourth inch to the foot will be secured for the floor for proper drainage.

While the barnyard pavement must have an even surface so that it will drain freely and can be kept clean, it should not be finished so smooth as to make it slippery. If carefully and thoroughly finished by using a wood float, it will have the same gritty texture of surface secured by finishing a concrete floor in this manner and will thus insure a sure foothold for the animals.

Not all the area which it is intended to pave need be laid out with forms at the same time. Forms for one row of slabs can be provided just as though a stretch of concrete walk were being laid. Then after having marked this strip off into ten-foot squares with intermediate form strips, alternate areas can be concreted and when these have hardened sufficiently, the cross pieces can be removed and the intermediate areas concreted. The operation is repeated for following strips, each of which serves as a form for one side of the strip next laid.

PROTECTING THE CONCRETE WHILE HARDENING

As outdoor floors, of which a concrete barnyard pavement is a type, expose a large surface to the atmosphere, the concrete should be prevented from drying out so that it will harden uniformly and thoroughly.



When finished with a wood float, the concrete barnyard pavement will have an even and gritty surface and be non-slippery in all seasons

A concrete-paved barnyard is a profitable investment from every standpoint—feeding stock, saving manure, movement of farm equipment in and out of buildings, and the general lessening of labor around the place

Just as soon as concreting has been finished and the concrete has hardened enough to prevent it from being marred by a protective covering of moist sand or earth, such a covering should be applied and should be kept in place and wet down during the first week or ten days so as to assist proper curing, as it is called. Final results may not be entirely satisfactory unless this precaution to protect the work is taken.

AMOUNT OF MATERIALS REQUIRED

The following table shows the amount of materials required to build pavements of various areas, based on a 1 : 2 : 3 mixture and a thickness of four inches:

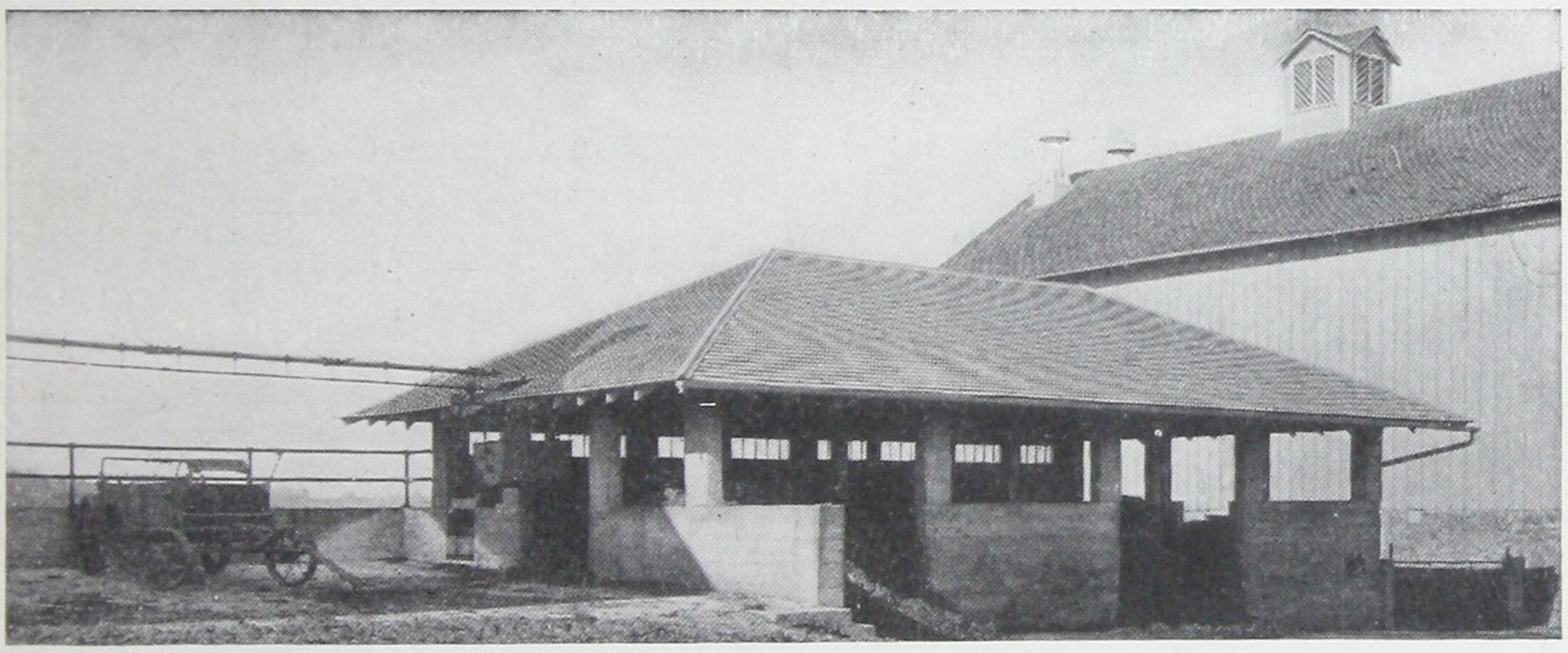
Square Feet of Pavement	Sacks of Cement	Cubic Yards of Sand	Cubic Yards of Pebbles
300	26	2	3
600	52	4	6
900	77	5¾	8¾
1200	103	7¾	11¾
1500	128	9½	14½

After the pavement has been protected by the earth covering for a week or ten days as suggested, covering may be removed and the pavement put to use, although heavy or loaded wagons should not be driven over the concrete until it is at least a month old. A barnyard pavement subjected to heavy loads should be at least six inches thick, otherwise four inches will be sufficient.

Manure Pits

Experiment stations have valued the manure produced by an average dairy cow during one year at $39.00.

Often the pressure of other farm work makes it impossible to haul manure to the field daily. If manure is exposed to the weather, much of



The modern way of handling manure, with a covered concrete pit, allows none of the valuable fertilizing elements to be lost

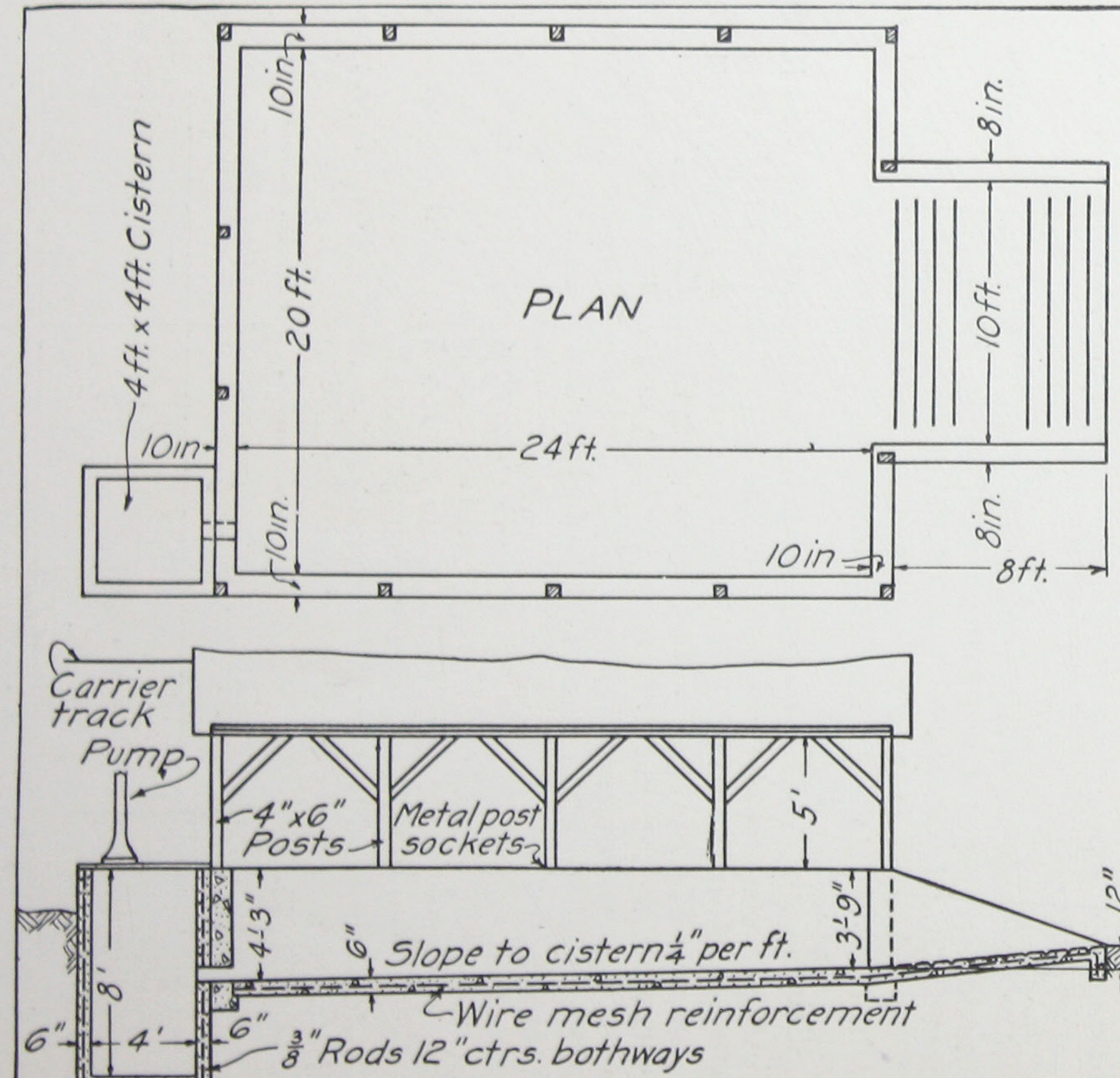
its fertilizing elements are lost within a short time. The Indiana Experiment Station estimates that one-third of all manure is wasted by improper handling. This is a yearly loss of $13.00 per animal. A concrete manure pit is the best insurance against this waste. Its watertight floor and walls save all the liquid content and permit practical control of decomposition of solid matter.

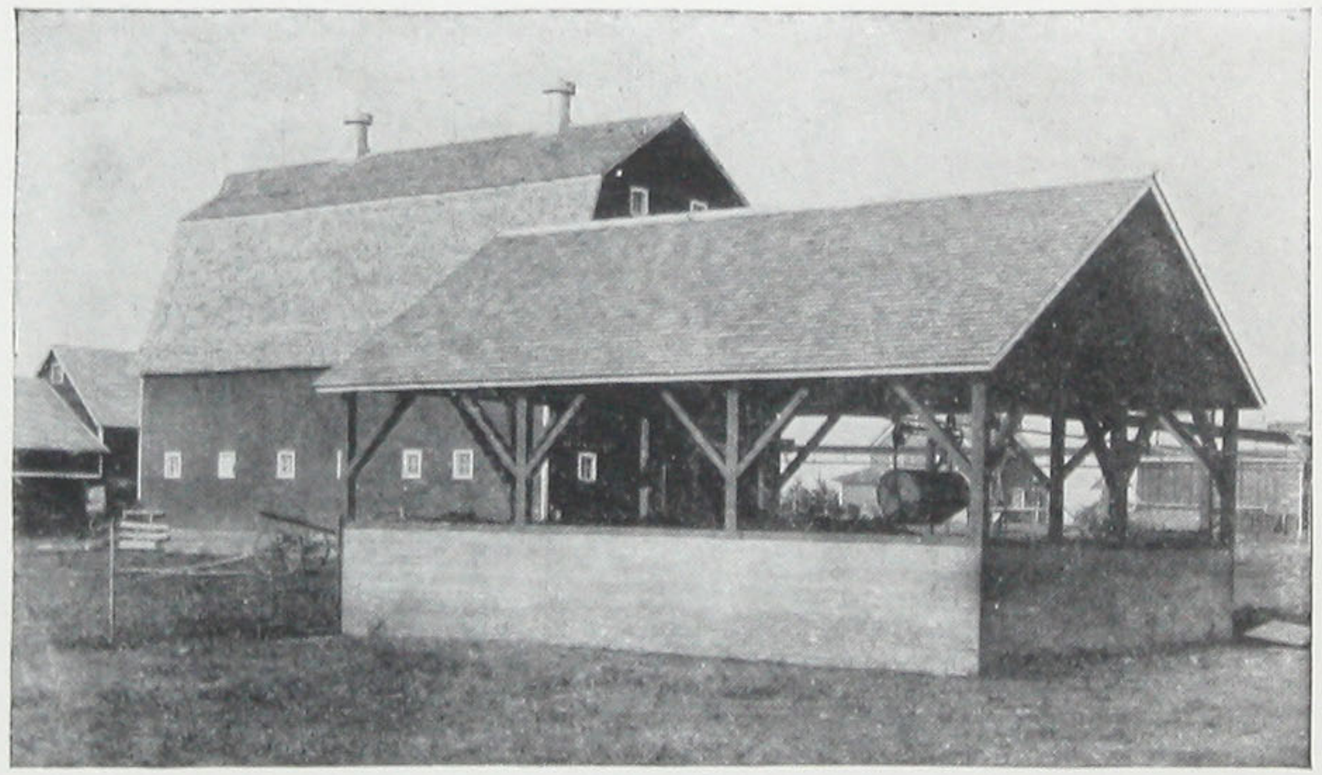
A simple and inexpensive pit may be built along and outside of the barn, using the barn wall as one side of the pit. Manure can be thrown into the pit from barn windows back of stock. However, a more approved type of pit is shown in accompanying illustrations. Such a pit is best located at some distance from the barn and will permit caring for manure in a more sanitary manner. It is desirable to place a roof over the pit to prevent excess rainwater from interfering with possible control of decomposition.

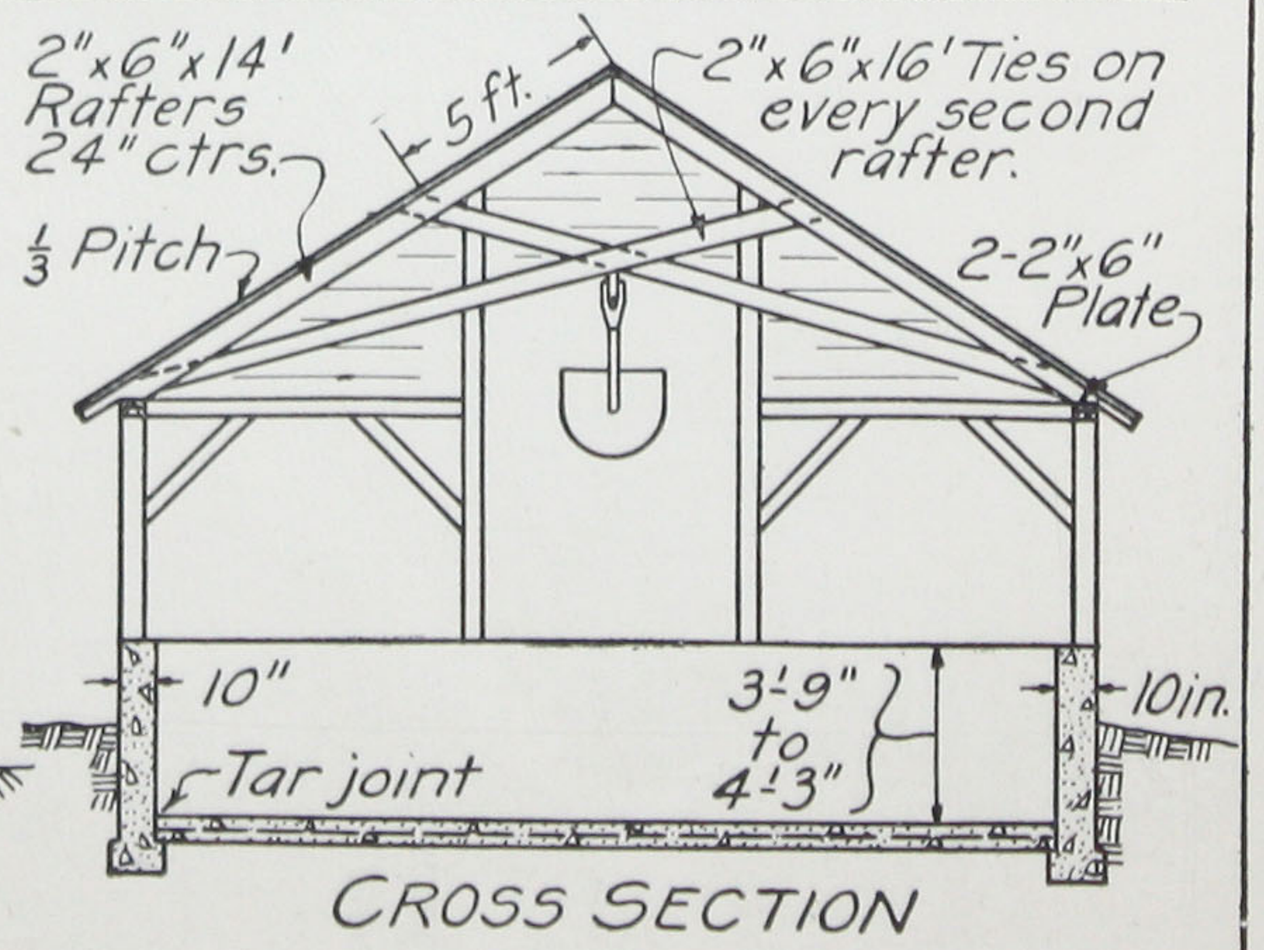
A location convenient for filling and emptying the pit is desirable. In large sizes, a driveway into the pit will save time and labor in loading. For long pits it is a good plan to build an approach at each end so that the spreader may be driven entirely through the pit.

The following table gives the approximate dimensions of pits required for dairy herds of different sizes:

Number of Cows	Length Feet	Width Feet	Average Depth Feet
10	16	16	4
20	24	20	4
30	30	24	4
40	40	24	4







Suggested design for a concrete manure pit and cistern having a capacity for 20 cows

As it is not always practical to use enough bedding in stalls to absorb all liquids, a cistern is often built as a part of, or near the pit, to hold excess liquids. The contents of this cistern may be pumped into a tank wagon and from it sprinkled on the land, or it may be sprinkled over the contents of the pit, as necessary, to assist control of rotting or decomposition. The latter practice will take care of moisture loss by evaporation.

Cattle or hogs are frequently allowed access to the pit so that they can trample the contents compactly, thus assisting to prevent loss of fertilizing elements from fermentation.

For the cistern and pit floor a 1 : 2 : 3 concrete mixture is recommended. For the walls of the pit a 1 : 2½ : 4 mixture may be used. The walls of the pit should be built first. Plans accompanying show the amount and spacing of reinforcement required.

Silos

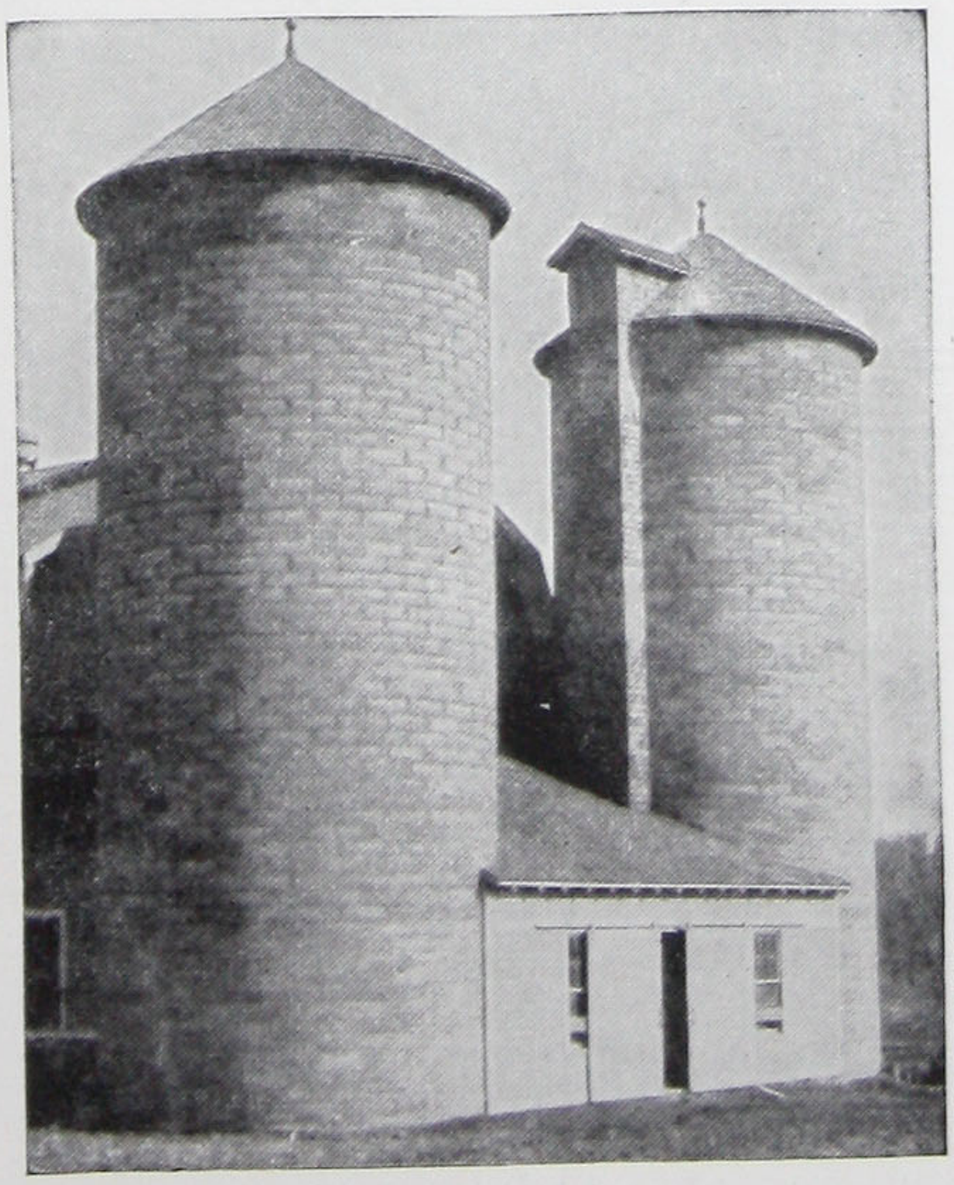
Dairymen have learned that silage not only increases their profits but takes a large proportion of risk out of their business. In fact, dairying could not be conducted profitably in some localities if it were not for the cheap, dependable feed that the silo makes available. The silo takes the stover that would otherwise stay in the field and lose its nutritious value for feed and converts it into a palatable feed, rich in milk-producing elements. Not only are the dangers of crop failures and short pastures eliminated, but with a permanent concrete silo the dairyman is also protected against loss of his stored feed supply through fire and storm.

For satisfactory service over the longest period of time, the concrete silo is supreme. Because of its freedom from maintenance, first cost is the only cost.

There are three common types of concrete silos, monolithic, block and cement stave.

CONCRETE BLOCK SILOS

Farmers who want a concrete silo, but wish to avoid buying forms for building the monolithic type, find the concrete block silo thoroughly practical. Silo block are curved so that when laid up, they will produce a circular silo. Such block may be purchased from a nearby cement products plant. These plants are to be found in almost all parts of the country and are equipped to turn out a first-class product. Names and addresses of concrete products plants making silo block will be furnished on request.

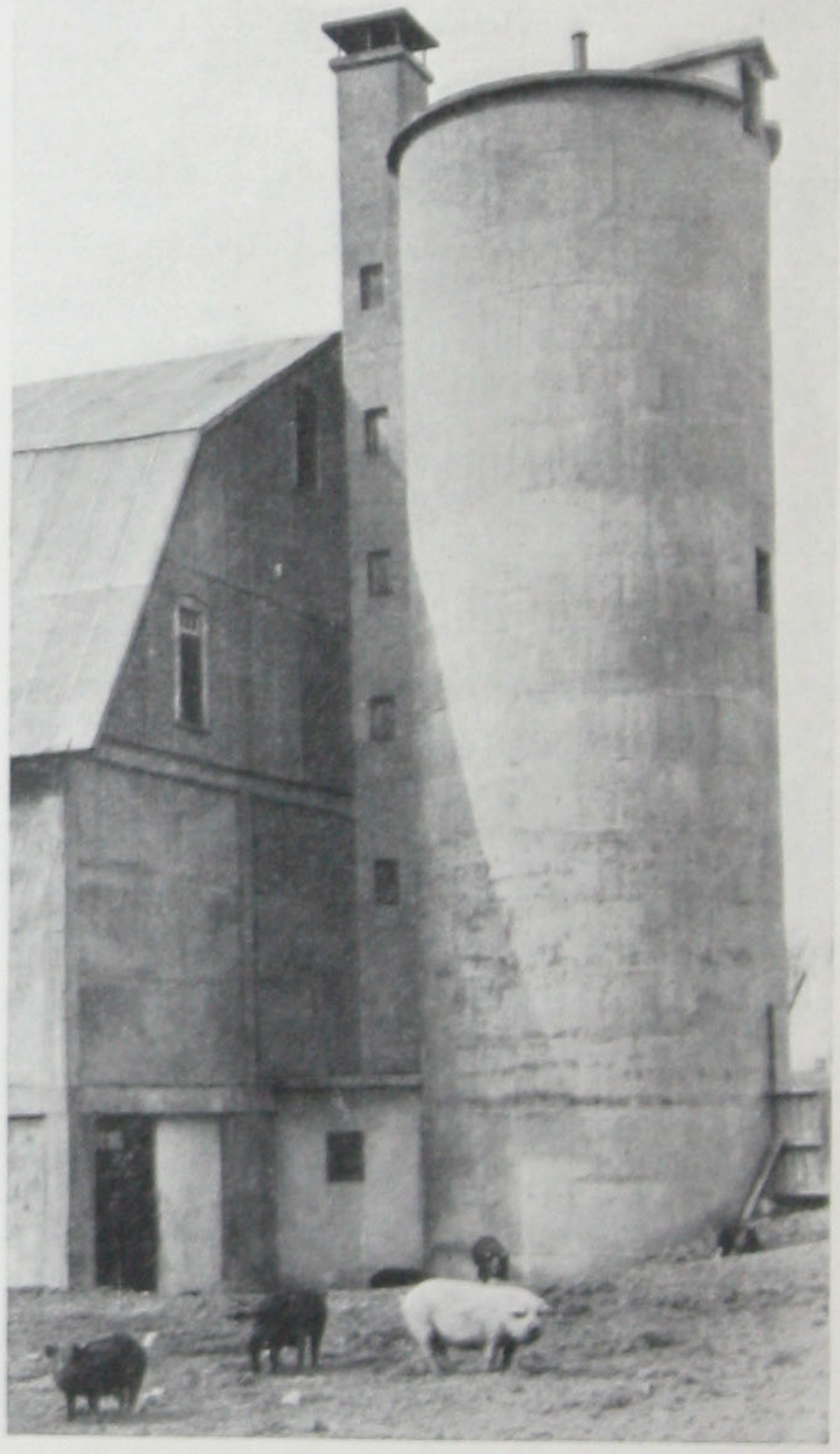


Concrete block silos are practical, easily built and permanent

MONOLITHIC SILOS

It is usually desirable to employ a contractor to build a monolithic silo. In many cases the actual cost of the silo built under contract is no greater than if the owner had built it himself. However, if a contractor is not available, the farmer may build his own monolithic silo if he can secure a good foreman to supervise the work, or is competent to do so himself. If a number of silos are to be built in one neighborhood, a saving can be made if the farmers or builders cooperate in buying forms that all may use.

Detailed information on monolithic and concrete block silos is contained in our booklet "Concrete Silos—Monolithic and Block," copy of which is free on request. Names of contractors will also be supplied.



The monolithic silo, cast in one solid piece, is a great favorite among dairymen

Many firms manufacture a cement stave silo similar to the one shown

CEMENT STAVE SILOS

The cement stave silo has become very popular during the last few years. The stave is a concrete slab usually about thirty inches long, ten inches wide and two and one-half inches thick. These staves have some form of interlocking edge, so designed that staves fit closely together and make an air and watertight silo. For added protection against possible leakage at joints, the interior is given a

cement-water coating which seals the joints and makes the silo walls smooth and absolutely tight. The manufacture and erection of the staves is handled by the products plant, enabling the farmer to buy a complete silo erected on his farm and ready to fill. Our booklet "Cement Stave Silos" tells the many advantages of this type of silo. Names and addresses of cement stave silo builders nearest you will be furnished on request.

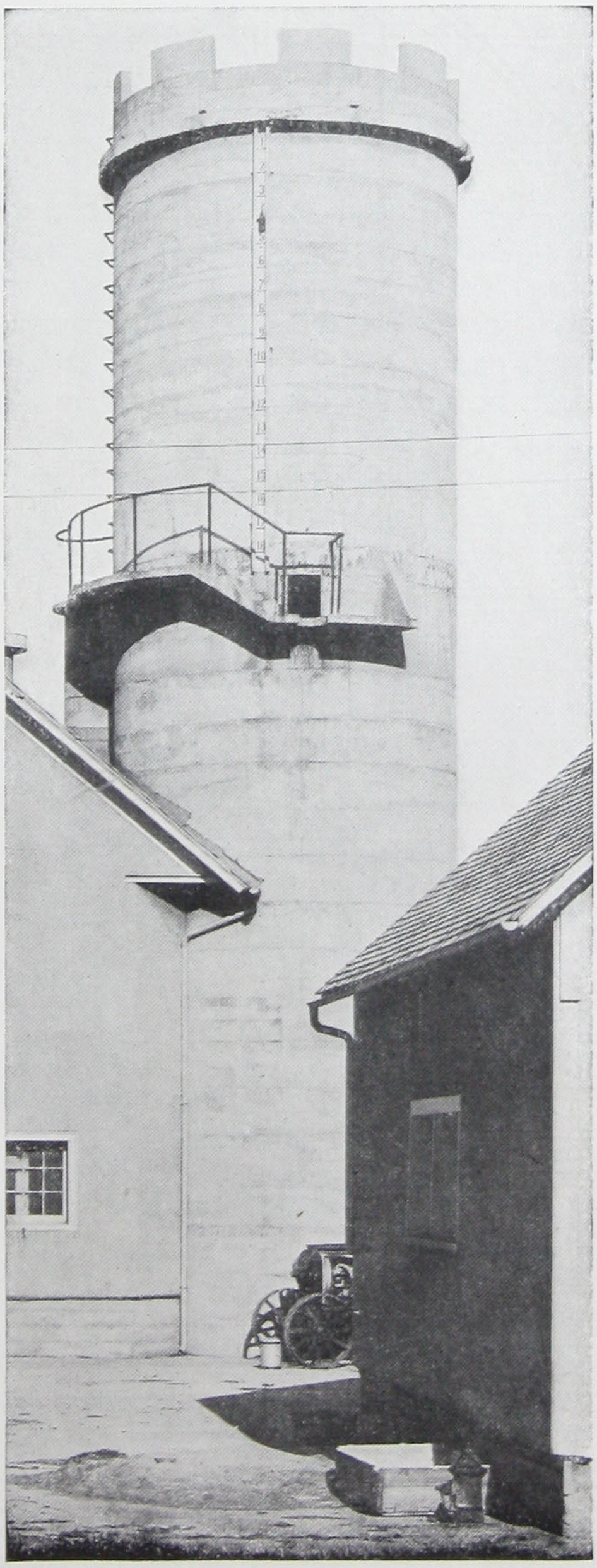
Farm Water Supply Systems

A dependable water supply on the farm enables the dairyman to locate watering troughs in any building desired and allows him to keep a plentiful supply of water before stock constantly. Dairy cattle need a large amount of good, pure water so it should always be where they can reach it.

The farmer's family benefits also from a farm water system. Water is on tap at the kitchen sink, laundry tubs and bathroom or wherever wanted in the house. Such provision for supply saves countless steps in doing housework.

Nothing is more practical and economical for providing a water supply system on a farm than a concrete tank built on top of a concrete silo. The height of a concrete silo is usually sufficient to insure adequate pressure for the water supply, while the structure is strong enough to furnish the required support for the filled tank.

A water supply system on the farm not only saves time and labor but provides a considerable measure of fire protection. Thousands of farmers are installing such systems and thereby providing themselves with many of the conveniences of modern city homes.



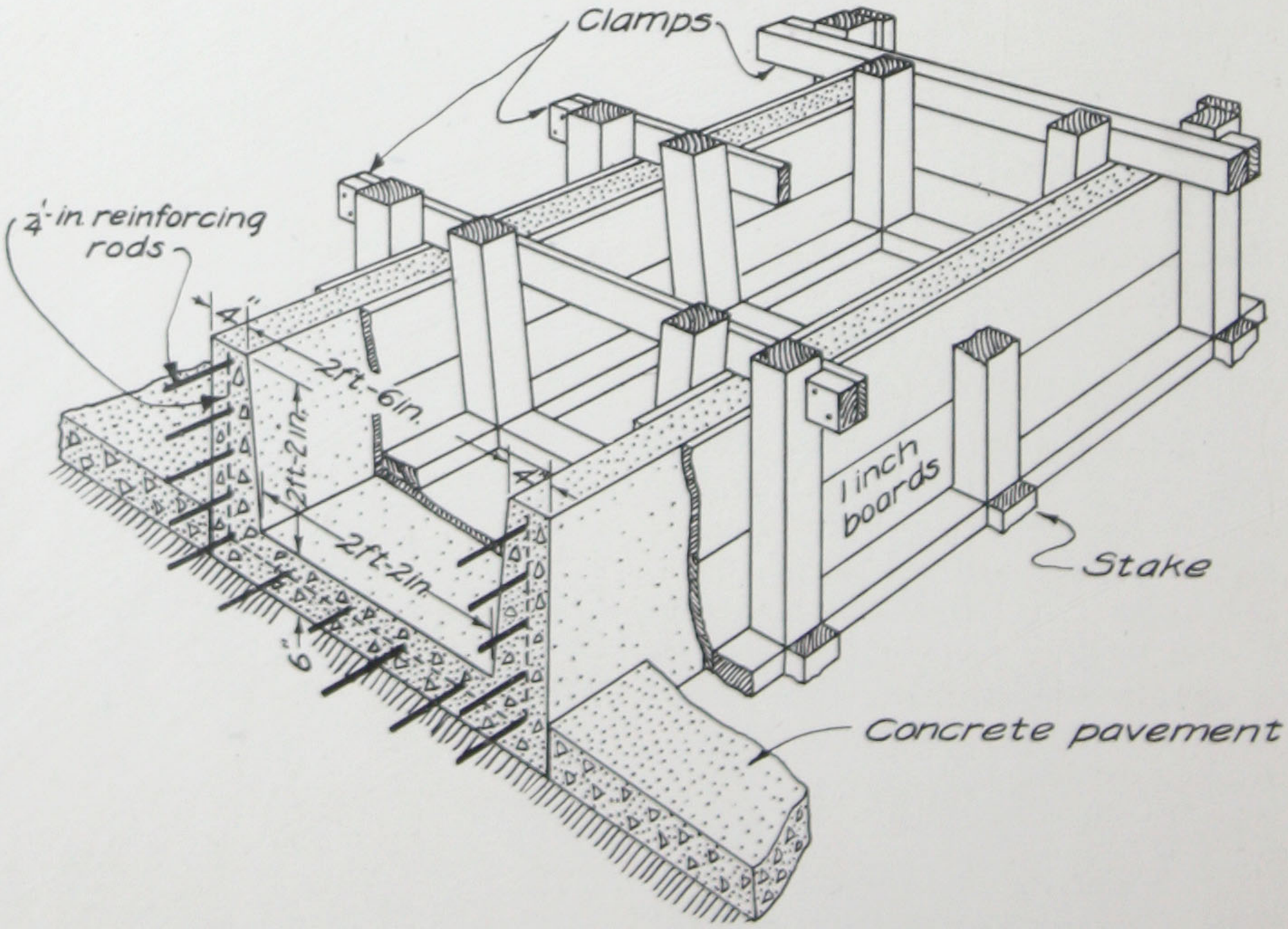
A water tank built on top of the silo provides water under pressure for the many uses on the farm and is especially valuable in case of fire

Watering Troughs

The principal requirement of a watering trough is, of course, that it be watertight. A concrete trough meets this requirement at a reasonable cost. It will keep in shape whether full or empty and can neither rust nor rot. It is also easy to keep clean and it is permanent. Any dairy farmer can build his own concrete watering trough.

Accompanying illustrations present plans for rectangular and circular troughs or tanks. Forms for either kind may be home-made but if commercial silo forms are available, they may be used to advantage if a circular trough or tank is to be built.

The following details of construction should be observed. Immediately after setting up the outside form, concrete is deposited to one-half the required thickness of the floor. Reinforcing rods are then placed in position as shown in the illustration. The reinforcing consists of quarter-inch round rods, bent to a "U" shape. When bent in this manner the rods not only reinforce the trough floor, but form part of the reinforcement (vertical) required for the sides and ends or walls. Reinforcing may be assembled before setting it in place, the "U" shaped rods being



MATERIALS REQUIRED FOR A RECTANGULAR TANK

Outside dimensions	3 ft. 2 in. by 8 ft.
Walls	2 ft. 8 in. high
Floors	6 in. thick
Concrete mixture	1 : 2 : 3
Volume of concrete	1¼ cu. yd.

Materials Required

Portland cement	9 sacks
Sand	¾ cu. yd.
Pebbles or broken stone	1 cu. yd.
¼-in. round steel rods	215 ft. (36½ lb.)

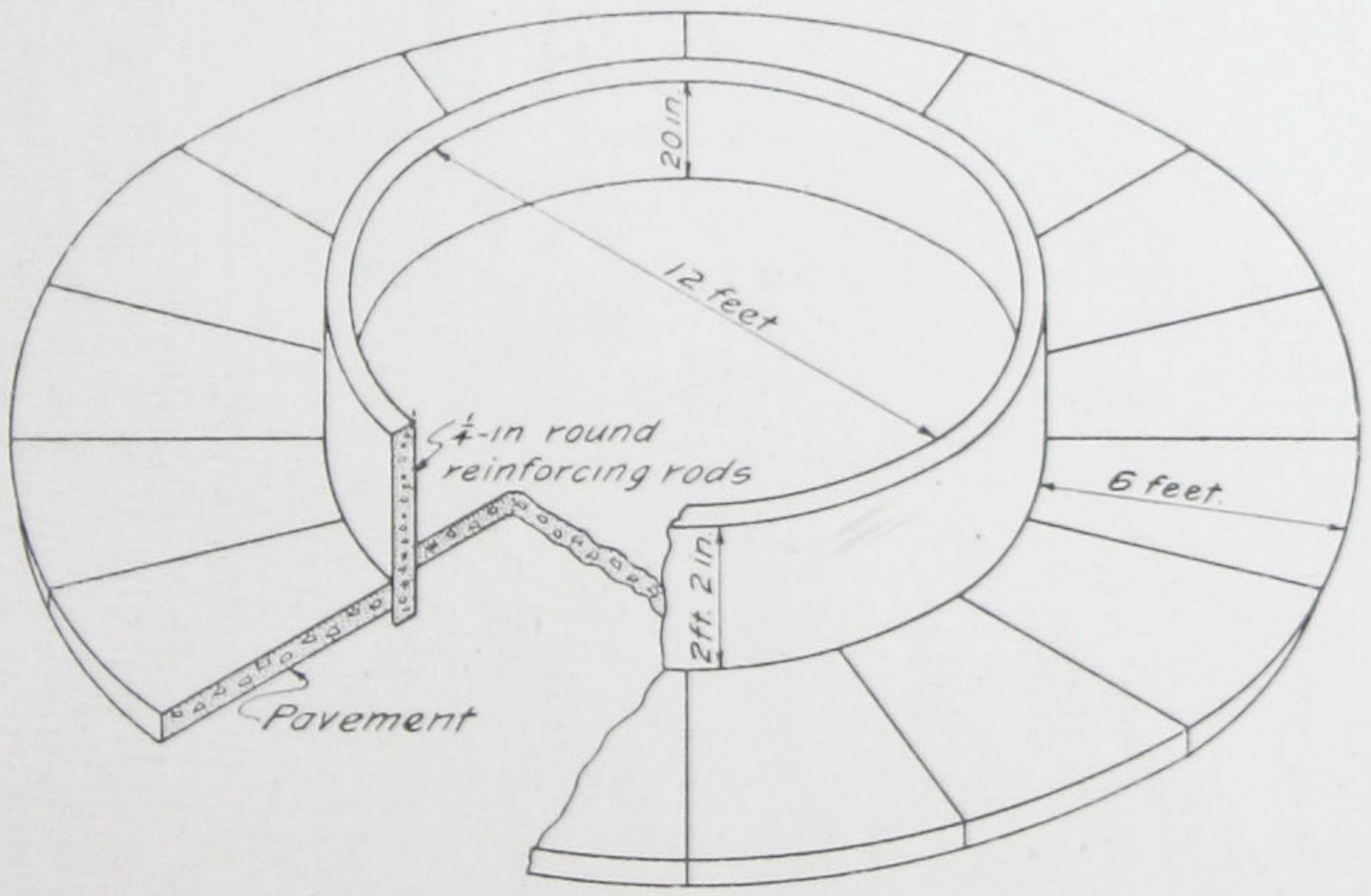
For each additional foot of length add to the foregoing quantities:

Portland cement	1 sack
Sand	2 cu. ft.
Pebbles or broken stone	3 cu. ft.
¼-in. round steel rods	22 ft. (3¾ lb.)

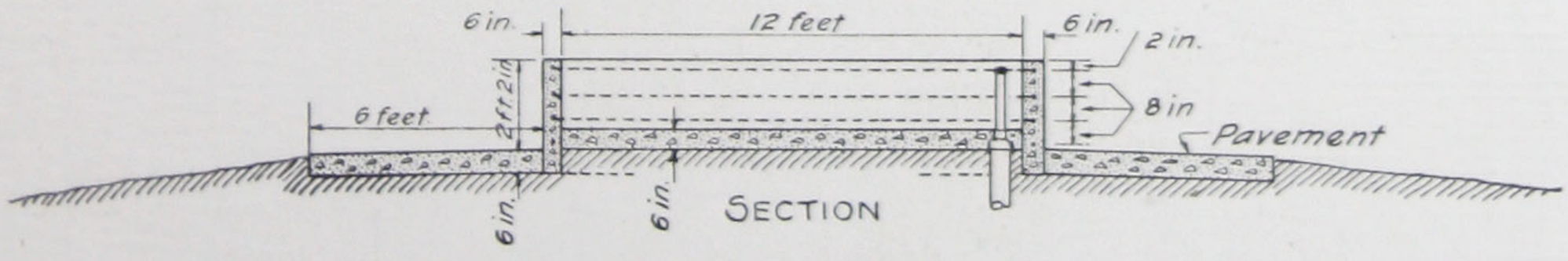
wired together at intersections so as to form sort of a cage or basket. After reinforcement has been placed as described concrete is then deposited to complete the thickness of the trough or tank floor. The inside form, which should always be built before concreting is started, is then set in position and secured by means of clamps extending across the forms. Concrete for the side walls is placed immediately so that there will be no construction joints where tank walls and floor join.

Concrete should be thoroughly spaded next to forms to force all large particles of aggregate back from the surface. This will insure a dense and even surface. The inside face of tank walls is battered, that is, sloped outward toward the top for the purpose of relieving pressure on tank walls in case ice forms.

After the concrete has hardened sufficiently to be self-sustaining, forms may be removed. It is advisable at this time to give the interior a cement wash to insure smooth interior surface and watertightness. The concrete should be protected from drying out for a week or ten days, after which time it may be put in use. Inlet and outlet pipes should be set while concreting is in progress.



GENERAL VIEW



SECTION

MATERIALS REQUIRED FOR CIRCULAR WATERING TANK

Outside diameter	13 ft.	*Materials Required*	
Walls	2 ft. 8 in. high	Portland cement	83 sacks
Floors	6 in. thick	Sand	6 cu. yd.
Concrete mixture	1 : 2 : 3	Pebbles or broken stone	9 ¼ cu yd.
Volume of concrete	11⅓ cu. yd.	¼-inch round steel rods	176 ft. (29½ lb.)

It is always desirable to build a concrete pavement around the tank. This will prevent the stock from forming a mudhole and will insure a dry place for them to stand while drinking. This pavement is constructed like a sidewalk or barnyard pavement, and may be laid after the tank is completed.

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